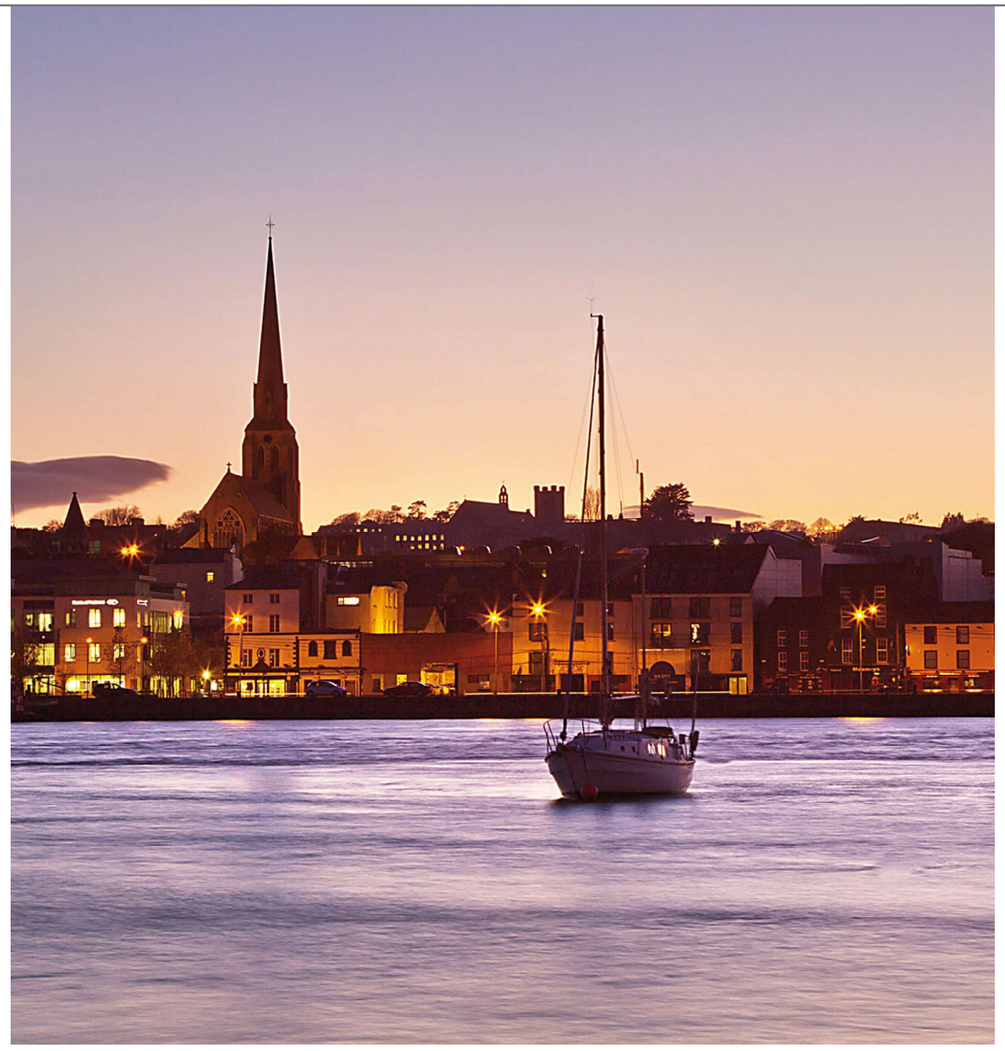


# Appendix C - Civil / Structural Engineering



# Engineering Report for Planning
# January 2019

Wexford County Council

STW Scott Tallon Walker ARCHITECTS

ROD ROUGHAN & O'DONOVAN



## Trinity Wharf Development

## Engineering Report - For Planning

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**Made:** ..... Stephen Harper

**Checked:**..... Mark Kilcullen

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# Trinity Wharf Development

## Engineering Report - For Planning

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## Acknowledgements

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Wexford County Council

Overall Project Management

Scott Tallon Walker Architects

Scheme Designers, Overall Project Managers

Landscape and Visual

CRDS Archaeological and Historical Consultants

AWN Consulting Ltd

Air Quality and Climate

Cunnane Stratton Reynolds

Landscape and Visual

CRDS Archaeological and Historical Consultants

Archaeology, Architecture and Cultural Heritage

RPS Group

Marina Design

Roughan & O'Donovan

Team Leaders, Report Authors and Scheme Designers, Biodiversity, Soils and Geology, Hydrology, Hydrogeology, Population and Human Health, and Material Assets and Land

# 1. INTRODUCTION

## 1.1 General

This 'Engineering Report for Planning' has been prepared by Roughan & O'Donovan Ltd. On behalf of Wexford County Council in support of the planning submission for the proposed Trinity Wharf Development.

Wexford County Council propose to submit to An Bord Pleanála under Section 226 of the Planning and Development Act 2000 and 177AE for approval of the EIAR and development consent for the proposed development. The following comprises a list of the principal documents proposed to be submitted in support of the application.

- Design Team Report;
- Drawings;
- Planning Statement;
- Environmental Impact Assessment Report;
- Natura Impact Statement;
- Engineering Report for Planning;
- Engineering Services Report
- Landscape Design Statement
- Traffic Impact Assessment Report.

The development comprises the following principal components:

- Site Access / Egress;
- Boundary and coastal sea wall / revetment protection to the site;
- Hotel with 6 storeys with 120 bedrooms;
- 3 No. advanced technology/office buildings of 5 storeys each;
- Arts / Cultural / Performance Building / Space;
- Public park and plaza with open performance space;
- Residential apartment building with 5 storeys, 58 no. apartments;
- Café/retail/restaurant bar;
- Multi-storey car-park with capacity for 462 spaces; and
- 64 berth marina.
- Landscaping;
- Boardwalk structure to link Paul Quay with Trinity Wharf;
- Roadworks Trinity Street, CCTV controlled level crossing of the railway and associated management building;
- Coastal Walkway around the perimeter of the site;
- Site infrastructure and services;
- Other ancillary works.

This report provides engineering background information in respect of the principal elements of the proposed development.





# 2. SITE INFORMATION

## 2.1 Site Location

Trinity Wharf currently comprises a brownfield site, approximately 3.6 hectares, located within the existing urban environment of Wexford town at the southern end of Wexford's quay-front. The site is currently accessed via a small side road from Trinity Street. The Dublin to Rosslare Railway line runs north south along the site's south-western boundary. Wexford Harbour adjoins the site on its north, east and southern boundaries. Refer to drawing No. TRWH-ROD-GEN-SW_AE-DR-CH-4051 Location Plan for details of the site's location.

## 2.2 Site Topography

The site consists of reclaimed land that extends into Wexford Harbour and was gradually reclaimed with the northern part reclaimed around 1832 initially as a dockyard area and then extended south-eastwards through the late 1800s and early 1900s. Topographic and bathymetric surveys of the site were commissioned by Wexford County Council in support of the design of the development.

The current site is relatively level with levels ranging from approximately 1.6m OD to 2.0m OD.

The tidal levels for Wexford Harbour have been derived using Volume 1 of the 2016 Admiralty Tide Tables for United Kingdom and Ireland. These standard levels are also applicable to Trinity Wharf as Wexford Harbour is located approximately 0.50km to the west of Trinity Wharf. The still water levels for Wexford Harbour are presented in Table 2.1 below.

| Wexford Harbour | Mean Sea Level (MSL)[m] | Chart Datum (CD)[m] |
|---|---|---|
| Highest Astronomical Tide | 1.12 | 2.3 |
| Mean High Water Spring | 0.82 | 2.0 |
| Mean High Water Neap | 0.22 | 1.4 |
| Mean Low Water Neap | -0.28 | 0.90 |
| Mean Low Water Spring | -0.68 | 0.50 |

## 2.3 Site Access

The current access to the site is via an informal gated level crossing XR162, which crosses the Dublin to Rosslare Railway Line from Trinity Street to the West corner of the site.

## 2.4 Site Landscaping

A landscaping design has been devised for the scheme in conjunction. A wild and emergent landscape character is proposed to complement and celebrate the locations natural assets. This will include sparse planting to the water sides with glades of single species tree planting developing into mixed species buffer planting along the rail line. This approach will suit the exposed nature of the site by using trees with visual character, repetitive aesthetics but informality of layout. Refer to the Landscape and Public Realm Drawing (TRWH-ROD-GEN-SW_AE-DR-CH-4061) based on the drawings of The Paul Hogarth Company.

# 3. THE PROPOSED DEVELOPMENT

## 3.1 General

The proposed development will provide a number of different land uses including; commercial leisure activities such as a hotel, marina, restaurants and bars, office space, residential housing and public realm including pedestrian & cycling facilities and a cultural centre.

The proposed development will provide a mixed-use building development, and include the construction of the elements:

- A six-storey 120-bedroom hotel of c. 9,950 m2 gross floor area and height of c. 21.15m (Ground Floor to Roof Plant Level);
- A six-storey multi-storey car park of c.12,750 m2 gross floor area providing 462 car parking spaces (including 23 spaces designated for people with disabilities) with a height of c.18.15m (Ground Floor to Roof Plant Level). In addition, a further 47 parking spaces are provided at surface level around the site. In total, 509 parking spaces are provided;
- A five-storey residential building of c.6,820 m2 gross floor area providing 58 apartments (8 no. one bed, and 50 no. two bed) with a height of c.15m (Ground Floor to Roof Plant Level), and ancillary facilities (communal open space, bicycle and bin stores);
- Office Building A, five storey, c.5,450 m2 gross floor area, height of approx. 20.0m (Ground Floor to Roof Plant Level);
- Office Building B, five storey, c.6,105 m2 gross floor area, height of approx. 20.0m (Ground Floor to Roof Plant Level);
- Office Building C, five storey, c.4,990 m2 gross floor area, height of approx. 20.0 m (Ground Floor to Roof Plant Level);
- A two-storey cultural/performance centre of c.2,945 m2 gross floor area and height of c.10.0m (Ground Floor to Roof Plant Level) with event capacity for up to 400 people;
- A two-storey mixed-use restaurant/café/ specialist retail building of c.1,530 m2 gross floor area and height of c.8.0m (Ground Floor to Roof Plant Level);
- A single storey management building of c.57 m2 gross floor area with a height of c.3.2 m (Ground Floor to Roof Level) with associated landscaping works and retaining walls to the main vehicular entrance road.

In addition, there is a public realm element to the development which consists of the following:

- A new vehicular entrance road with a signalised junction on Trinity Street, widening of Trinity Street, a new CCTV controlled railway level crossing and associated works;
- A new sheet-piled sea wall around the existing Trinity Wharf site (c.550m overall length) faced along the north-western section with precast concrete panels (c.81 m length) and rock armour (for c.62 m length) and along the south-eastern section with a rock armour revetment (c.187 m length) and





exposed sheet-piled walling along the north-eastern side (c.220 m length) with ground level across the site raised to typically 3.5m OD Malin;

- Site infrastructure works including ground preparation works, installation of foul and surface water drainage, wastewater pumping station, services, internal roads, public realm and landscape including a public plaza with 1,000m2 open performance / events space. A total of 146 bicycle parking spaces throughout the development of which 90 spaces are dedicated to the residential development;
- A pedestrian/cycle boardwalk/bridge (c.187m long) connecting with Paul Quay, with gradual sloped access ramps (max. 1:20 gradient) of c.55m length on Paul Quay and c.24m at the Trinity Wharf development site;
- A 64 berth floating boom marina in Wexford Harbour;
- Landscaping Design & Plan.

The proposed development will require the demolition and excavation of several existing structures, including:

- Existing redundant boundary sea wall
- Hard standing area and retaining wall located adjacent to the site.
- Partially demolished structures remaining from the previous occupants of the site.

Refer to drawings TRWH-ROD-GEN-SW_AE-DR-CH-4053 and TRWH-ROD-GEN-SW_AE-DR-CH-4062 for details of the proposed development layout.

## 3.2 Programme

It is anticipated that the complete construction programme for the Works will be 80 months, including 1-month mobilisation. There will be a 1-year defects and handover period thereafter.

The following table provides outline construction periods for elements of the scheme.

| Works element | Duration of task (approx.) | Completion |
|---|---|---|
| Completion of Site preparation works – Site clearance and boundary security | 6 months | 6 months |
| Establishment of site access; temporary level crossing establishment, permanent junction construction | 2 months | 8 months |
| Installation of marina breakwaters | 0.5 months | 8.5 months |
| Construction of sheet piling wall and rock armour revetment along south-east boundary. (overlap with previous task) | 4 months | 12 months |
| Installation of boardwalk piling. (Overlap with previous) | 3 months | 13 months |
| Earthworks, drainage and services, and sheet pile wall | 6 months | 17 months |

| Works element | Duration of task (approx.) | Completion |
|---|---|---|
| anchorage installation throughout the site. | | |
| Boardwalk construction | 4 months | 21 months |
| Phase 2 Buildings Development | 24 months | 45 months |
| Marina Construction | 2 months | 47 months |
| Phase 3 Buildings Development | 30 months | 77 months |
| Public realm works, landscaping, completion of permanent level railway crossing. | 3 months | 80 months |

### 3.3 Statutory and Other Bodies on the Site

The following is a non-exhaustive list of Utility companies affected by the works that will require advance notification. The utility companies may require a representative to be present and the Contractor will advise all utility companies prior to the work commencing. Contact by the contractor will be made immediately with any other utilities encountered:

- Wexford County Council Water Services and Drainage Departments;
- Wexford County Council Roads and Traffic Departments;
- Wexford County Council Public Lighting Department;
- Irish Water;
- ESB;
- Eircom;
- Gas Networks Ireland;
- BT Communications;
- Digital Hub MAN;
- Magnet;
- O2;
- Meteor;
- Vodafone;
- Three Mobile;
- UPC.

The Contractor will satisfy himself that the appropriate utility drawings are current and correct and will confirm the exact location and depth of all services and utilities on site prior to excavation.

### 3.4 Buildings

One of the principal objectives of the Trinity Wharf Development is the construction of buildings for commercial investment. The proposed buildings are as follows:

- Hotel with 6 Storeys with 120 bedrooms and 9950m$^2$ floor space;
- 3 No. Advanced Technology / Office Buildings (5 storeys each) totalling 16,545m$^2$ floor space;
- Residential apartment building with 5 storeys, 58No. apartments and 6820m$^2$;





- Café/ Retail/Restaurant bar as an evening and weekend attraction, complementary to provision in the main town centre, circa 1530m2;
- Single storey service building, circa 57m2;
- Arts/Cultural/Performance Building/Space; provision for a high quality, distinctive, feature Arts/Cultural/Performance building of 2,600m2 and;
- Multi-storey car-park of 6No. storeys with capacity for 462 spaces, circa 12750m2.

The general overall palette for building materials and finishes is as follows:

- Pale white polished reconstituted stone panelling system
- Glazing System with PPC Aluminium Framing, Ventilation Louvres and Brise Soleil (Colour RAL 7006: Beige-Grey)
- Louvres and Rood Plant Enclosures- PPC Aluminium (Colour RAL 7006: Beige-Grey)
- Glazed Balconies to Apartments

A rippled bronze-coloured, high-quality light-weight screen cladding system is proposed for the car park building

The structural design of the buildings will typically comprise reinforced concrete flat slab and drop beam construction on reinforced concrete columns. Shear cores will be provided at stair locations. The foundation design is proposed to consist of driven steel or concrete piles dependent on the detailed site investigation. The buildings will house enclosed mechanical plant on their roofs.

The single storey service building will be constructed in solid blockwork with external lining and supported on a reinforced concrete ground slab subject to detailed site investigation. The roof is likely to be of weatherproofed timber construction.

Table 4.2 below details the proposed building development.

**Table 3.1 Building Development**

| Building | No. of Floors | Total floor area ($m^2$) | Total height (m) | Function/Activities |
|---|---|---|---|---|
| Hotel | 6 | 9,950 | 21.15 | Hotel with a capacity of 120 bedrooms. Hotel will be equipped with a bar and external terrace. |
| Cultural Centre | 2 | 2,945 | 10.0 | The cultural centre is part of the public realm project and is intended as an arts/cultural/performance building for a high quality, distinctive, feature arts/performance buildings. The building is complemented by the central plaza which is intended hosts outdoor events as an alternative arena to the cultural centre. |
| Retail | 2 | 1,530 | 8.0 | The retail building is intended to accommodate a café and retail shop on the ground floor and a restaurant/bar on the first floor as an evening and weekend attraction and as a complementary provision to the main town centre. |
| Office Type A | 5 | 5,450 | 20.0 | Office Business activity |
| Office Type B | 5 | 6,105 | 20.0 | Office Business activity |
| Office Type C | 5 | 4,990 | 20.0 | Office Business activity |
| Residential Development | 5 | 6,820 | 15.0 | The residential building will provide the following:<br>• 8 No. 1 bedroom apartments<br>• 50 No. 2 bedroom apartments<br>In addition, the residential scheme is to comply with the 'Sustainable Urban Housing: Design Standard for New Apartments – Guidelines for Planning Authorities' (DHPLG March 2018). |
| Multi-storey Car Park | 6 | 12,750 | 18.15 | The multi-storey car park is proposed to provide 462 spaces. |
| Management Building | 1 | 57 | 3.2 | Single storey service building |





## 3.5 Earthworks

A review of the previous flood risk assessments and the study carried out for this project has determined that a minimum ground floor level of 2.64mOD should be adopted for all buildings within the development. The local roads within the site should have a minimum level of 2.34mOD. These satisfy the requirements of the OPW's Flood Risk Management Guidelines for Local Authorities and the Wexford Town and Environs Development Plan. The review suggested that a 2.4m OD revetment/sea wall with a 1m parapet wall along the sea adjacent perimeter of the site is suitable to protect the development against storm surge and wave action. Therefore, the internal site levels have been set above the minimum level required and the perimeter level of the site has been set at 3.5mOD.

The existing levels across the site vary, however, are on average around 2.0mOD. The general finish level of the proposed development site will be raised over the existing by approximately 1.5m. The lowest proposed finished floor level for the development is 3.00mOD, while the lowest road level will be at 2.80mOD.

Historical evidence and site investigations carried out to date have indicated that excavated material arising from the earthworks will typically be contaminated to the extent it will not be suitable for processing into acceptable fill material. All fill material to be placed on site will, therefore, be imported from third party sources.

Earthworks fill material will be Class 1, 2 and 6 materials in accordance with the TII Specification for Works.

**Background**

Trinity Wharf is a brownfield site, approx. 3.6 Ha, located at the southern end of Wexford's quay-front. The site consists of reclaimed land that extends into Wexford Harbour and was gradually reclaimed with the northern part reclaimed around 1832 initially as a dockyard area and then extended south-eastwards through the late 1800s and early 1900s. Owing to the industrial history, the superficial soils are dominated by relatively deep layers of Made Ground.

For the purposes of the planned development, the level of the ground will be raised using imported material and retained by the sheet pile walls along the perimeter of the site. Buildings will be founded on piles extending to competent bedrock.

A marina consisting of moored or anchored floating elements is planned on the site's northern corner. A boardwalk supported on discrete piles is also planned, that will connect the northern corner of the wharf to Paul Quay. Soils and Geology impact is here assessed for these two structures along with the Trinity Wharf brownfield site development.

A desk study of the study area of the proposed development was carried out in order to establish baseline conditions. The desk study involved collecting all relevant geological, hydrological, hydrogeological and meteorological data for the area. A suite of geological maps published by the Geological Survey of Ireland (GSI) were consulted as a part of the desk study. The maps included the bedrock, quaternary sediments, groundwater vulnerability and Geological Heritage sites, among other

themes. Aerial and site-based photographs as well as historical maps and reports were also consulted as a part of the desk study. The desk study was followed by a walkover survey by ROD engineers in 2018, with observations used in preparation of this chapter.

The following site investigation reports were consulted in the preparation of this chapter:

- Kavanagh Mansfield and Partners (2008): Report on a site investigation for a development at Trinity Wharf Wexford;
- RPS (2018): Trinity Wharf Marina Feasibility Study (project number IBE1115/D03)
- RSK (2018): Preliminary Asbestos Walkover Survey, Trinity Wharf, Wexford

The 2008 investigation consisted of 13 cable percussive boreholes in overburden and 9 rotary core boreholes in the bedrock. A suite of geotechnical laboratory tests for determination of the geotechnical soil parameters was carried out on the samples from the boreholes. The environmental testing was carried out on seven samples. The environmental testing was in accordance with “Murphy Suite” which determines the suitability of the soils for acceptance into licensed landfill facilities.

A Preliminary Asbestos Walkover Survey was undertaken in October 2018 which involved a walkover survey by RSK’s qualified asbestos surveyor. Sampling and testing of seven samples was undertaken and a map of general areas impacted with ACMs was developed. The Asbestos Survey Walkover report by RSK is attached as Appendix 8.1 of the Environmental Impact Assessment Report for reference.

**Bedrock Geology**

The Geological Survey of Ireland (GSI) 1:100,000 bedrock map indicates that the site is underlain by the Shelmaliere Formation consisting of white and purple quartzites with slates. Cullenstown Formation (grey-green metagreywacke & slate) and Ballysteen Formation (limestones and shales) are also found in the close vicinity.

The ground investigation carried out in 2008 indicates that the site is underlain by the moderately weak to strong, thin to medium bedded, slightly cherty limestone. The limestone was locally found to be interbedded with dark calcareous mudstone. This description matches well with the Ballysteen Formation features. Only one borehole (RC15) indicated the presence of interbedded sandstones and siltstones.

The bedrock in the northern part of the site is typically observed at 10.2 – 11.5 m bgl, overlain by the 0.5-1m of weathered bedrock returned as angular clayey gravel. The bedrock at the southern end of the site was observed at approximately 5m bgl, overlain with 1m of weathered bedrock returned as angular clayey gravel. The central part of the site exhibits a very deep zone of highly weathered bedrock. For instance, borehole RC7 shows the weathered rock, recovered as gravel and cobbles, to extend from 11m bgl down to 22m bgl, with no competent bedrock encountered in this borehole.





**Soils and Subsoils**

The area is entirely covered by the Made Ground of very heterogenous composition. Clay, rubble, stone, ash, concrete and slag were all observed as constituents. The strength and density vary accordingly and the thickness of the Made Ground varies from 1.5m to 4.1m.

The Made Ground is underlain by alluvial soil typical of the riverbanks. The alluvial soils are predominantly encountered as soft to firm sandy silts and loose silty sands. It is believed that these soils have undergone a degree of consolidation under the Made Ground layer and building loading, explaining why no very soft material was encountered. The thickness of the alluvial soils ranges from 1m to 5m.

Firm to stiff gravelly clay (widely known as glacial till or boulder clay) underlies the alluvial soils and overlies the weathered bedrock. The thickness of the gravelly clay ranges from 2m to over 8m in BH16.

**Environmental Testing**

Environmental contamination testing was carried out on seven samples as a part of the 2008 geotechnical investigation procured by Kavanagh Mansfield and Partners. The environmental testing was in accordance with “Murphy Suite” which determines the suitability of the soils for acceptance into licensed landfill facilities. The testing found elevated levels of polycyclic aromatic hydrocarbons (PAHs) and sulphates in the Made Ground stratum in five out of seven samples. In general, low to moderate levels of contamination have been noted.

The Preliminary Asbestos Walkover Survey undertaken on 18th October 2018, identified fragments of asbestos cement and floor tiles and / or floor tile debris in numerous locations across the surface of the site. Seven samples were collected by RSK and asbestos was confirmed in five out of the seven samples. The preliminary findings indicate that asbestos containing materials (ACMs) are broadly concentrated along the retaining wall in the northern portion of the site; along the edges of floor slabs; adjacent to and within many of the demolition stockpiles and in the gravel track along the eastern boundary. No suspect ACMs were identified within the grassed area or were visible on the surface of the stockpiles in the southern portion of the site.

The sea bed in the vicinity of the Trinity Wharf development, corresponding to the location of the boardwalk and the sea wall / revetments, was sampled and tested as a part of the Trinity Wharf Marina Feasibility Study by RPS Group (November 2018). A comprehensive sampling programme was undertaken in July 2016 by Hydrographic Surveys Ltd to inform the feasibility study, whilst the sediment quality analysis was undertaken by the RPS Laboratory Services. The samples returned values above the upper guidance threshold for organochlorine pesticides (OCPs) and PAH levels that are substantially in excess of the lower guidance limit (Marine Institute’s Guidelines for the Assessment of Dredge Material for Disposal in Irish Waters). Generally speaking, the area returned results showing mild levels of contamination in the sediments although in a couple of instances there were moderate levels of contamination.

**Groundwater**

The groundwater was observed at approximately 1.5m – 2.0m below ground level, coinciding with the sea level.

Groundwater vulnerability is indicated as low on GSI's 1:100,000 map. However, the site-specific assessment, accounting for up to 4 m of predominantly high permeability Made Ground and 2m of imported material overlying the aquifer composed of sandy silts, sands, gravels and bedrock, indicates that the groundwater permeability is high according to the GSI Groundwater Vulnerability Classification Table 3.1 below.

**Table 3.1 GSI Groundwater Vulnerability Classification Table**

| *Vulnerability Rating* | *Hydrogeological Conditions* | | | | |
|---|---|---|---|---|---|
| | *Subsoil Permeability (Type) and Thickness* | | | *Unsaturated Zone* | *Karst Features* |
| | High permeability (sand/ gravel) | Moderate permeability (e.g. sandy subsoil) | Low permeability (e.g. clayey subsoil, peat) | (Sand/ gravel aquifers only) | (<30m radius) |
| Extreme (E) | 0-3.0m | 0-3.0m | 0-3.0m | 0-3.0m | - |
| High (H) | >3.0m | 3.0-10.0m | 3.0-5.0m | >3.0m | N/A |
| Moderate (M) | N/A | >10.0m | 5.0-10.0m | N/A | N/A |
| Low (L) | N/A | N/A | >10.0m | N/A | N/A |

The main receptor in the study area is the river Slaney / Wexford harbour, with Made Ground being the primary pathway for received precipitation.

**Management of Geotechnical Works**

The Made Ground stratum was found to exhibit low to moderate levels of contamination, primarily from PAHs and sulphates. The contamination is believed to stem from the historical industrial usage of the site. In addition to that, the asbestos containing materials have been identified on the surface of the site. Mild to moderate levels of contamination with OCPs and PAHs were found in the samples from the sea bed.

While the intention is for the construction works to be carried out with the least feasible disturbance of soils, some relatively minor amount of soil stripping or excavation can be expected. This primarily pertains to the construction of the access road and the foul sewage pump-out station. Any excavated material will be disposed of to a licensed and permitted landfill site, the type of which will be determined in accordance with the actual level of contamination and waste acceptance criteria. Inert, non-hazardous and hazardous waste will be stored in separate bunds and will be disposed of to the separate suitable licensed and permitted sites.

The current ground level will be raised for the purpose of the development, using imported good quality granular material.

The pronounced heterogeneity of Made Ground and the relatively high compressibility of the alluvial soils could result in excess settlements due to structure loading. For this reason, the structures are planned to be founded on end-bearing driven piles extending into the competent bedrock.





**Geotechnical Reference Material**

A number of reference were used in development of the Geotechnical design including the following:

- Institute of Geologists of Ireland (IGI) (2013) Guidelines for the Preparation of Soils, Geology and Hydrogeology Chapters of Environmental Impact Statements
- National Roads Authority (NRA 2008) Guidelines on Procedures for Assessment and Treatment of Geology, Hydrology and Hydrogeology for National Road Schemes
- Environmental Protection Agency (EPA 2017) Draft Guidelines on the Information to be contained in Environmental Impact Assessment Reports
- Waste Management Act (1996)
- Kavanagh Mansfield and Partners (2008): Report on a site investigation for a development at Trinity Wharf Wexford
- RPS (2018): Trinity Wharf Marina Feasibility Study (project number IBE1115/D03)
- RSK (2018): Preliminary Asbestos Walkover Survey, Trinity Wharf, Wexford

## 3.6 Sea Wall

The existing sea wall bounding the site comprises a combination of shallow rock armour along the southeast edge, reinforced concrete wall along the northeast edge and stone masonry wall along part of the northeast edge and all of the northwest edge of the site.

The structural wall on the northeast and northwest edges show signs of deterioration throughout the reinforced concrete and masonry sections and has been assessed to be inadequate to be maintained or rehabilitated for the proposed development.

In addition, due to the flooding requirements, the level of the development is required to be raised by approximately 1.5m above its current level. Utilising and modifying the existing sea wall for the purposes of this development is therefore unfeasible and as such a new sea wall must be constructed around the perimeter of the site.

The choice of the preferred design configuration for the sea wall was driven by several principal concerns. They include:

- The need to curtail impacts on the SAC and SPA;
- The presence of contaminants on the existing wharf and on the foreshore;
- The very poor structural condition of the existing walls at the site;
- The requirement to raise the overall site level above design flood levels;
- The need to address wave reflection to adjacent areas consequent on raising the wharf site;
- To provide site boundary treatment consistent with to the high aesthetic quality pertinent to the overall development;

- To provide a design which is durable and can be safely maintained throughout it's design life.

The preferred design comprises an anchored steel sheet pile wall along the three seaward sides of the site with wave attenuation revetments in selected areas for mitigation purposes.

The proposed sea wall consists of a combination of a vertical sheet pile wall along the northeast and northwest edges of the site and a rock armour revetment along the southeast. Cathodic protection will be installed to the sheet pile wall in order to protect against corrosion. See drawings No. TRWH-ROD-GEN-SW_AE-DR-CH-4081 and 4082 for details of the sea wall.

The sheet piled wall comprises steel sheet piles to be installed around the coastal perimeter of the site to create a coastal defence level of approximately 3.5mOD in order to retain the levels of the development site. The sheet piles will be vibratory installed and embedded into the stiff gravelly clay layer at approximately -10.5mOD. The sea wall design will consist of ground anchors or tie bars connected to a row of sheet piles driven into the made ground and located approximately 12m behind the retaining wall. A reinforced concrete capping beam will be constructed along the top of the wall throughout within which the anchor head will be located, and a 1.4 m high railing will be installed along the top of the capping beams.

Along the south-east edge of the site, rock armour will be placed on the sea bed immediately in front of the sheet pile wall to form a 1 in 1.5 sloped revetment. The purpose of this is to reduce the possibility of wave reflection to the moored vessels in Good Tide Harbour.

**Preliminary Design**

The preliminary design of the sea wall was carried out using WALLAP soil structure interaction software. Separate models were developed for each wall configuration. The alternative details are shown on drawings TRWH-ROD-GEN-SW_AE-DR-CH-4081 and 4082.

Design parameters including water levels and wave heights were determined by hydrodynamic, sediment transport and marine environmental modelling, carried out by RPS Consulting Engineers.

Wave runup and overtopping calculations and the revetment design calculations were carried out by hand. The structural design was carried out for a design return period of 1 in 200.

## 3.7 Boardwalk

The proposed boardwalk is to be located immediately to the north of the main development site in Wexford Harbour and will be a pedestrian/cycleway link bridge from Paul Quay to the northern corner of the development site. The cycleway path





provided by the boardwalk will enable a tie-in of cycleway facilities from the Wexford Town promenade to the Trinity Wharf Public Realm cycleway facilities.

The total length of the boardwalk is 180m between end supports and will have an internal width of 6m between handrails to accommodate both pedestrians and cyclists. The northern end of the boardwalk will tie-in to the existing promenade of Paul Quay and the southern end will tie-in to the public space immediately adjacent to the proposed hotel at Trinity Wharf.

The boardwalk superstructure will be constructed above the maximum design water level and the expected significant wave height for storm with a return period of 1 in 200 years. This will ensure that small marine craft can pass under the boardwalk but also, pedestrians on the structure will be well protected in adverse weather conditions, however, provision will be made for potential closure of the boardwalk during storm conditions.

In order to accommodate the level difference between the proposed deck level and the existing promenade levels at Paul Quay, an approach ramp with a slope of 1 in 20 will be constructed at Paul Quay in the area where there are currently car parking facilities. The approach ramps will comprise reinforced concrete channels, infilled with granular material.

See drawings No. TRWH-ROD-GEN-SW_AE-DR-CH-4085 & 4086 for details of the boardwalk.

**Aesthetic Considerations**

Aesthetic considerations in respect of the bridge were lead by the project Architect – Scott Tallon Walker. Their architectural design statement says of the boardwalk:

> *'It was identified that providing a feature building, with active frontage along the waterfront connected to Paul Quay by a boardwalk, and a reconfigured sea wall would help transform this 'left-over' area into an attractive, yet unique part of Wexford's varied quay-front. Key to this is the design of the boardwalk connection between Paul Quay and Trinity Wharf and adjacent sea wall. The boardwalk is designed as a light, but solid, curving sculptural element above the water using robust materials – the external side panels are painted metal sheets that provide a sense of enclosure and protection to pedestrians and cyclists from the rough waters. At either end, the boardwalk lands on a solid concrete base achieved using precast concrete fixed to the sheet piling around the site. This extends along the hotel terrace and then changes to rock armour which continues as far as the railway embankment. As a combination, the boardwalk, concrete and rock armour visually relate this part of Trinity Wharf with the southern part of Paul Quay, so that this area has a unified character and own, unique sense of place.'*

**Approaches**

The proposed structure is articulated at its end supports with expansion joints. The arrangements at each end will provide a transition over the length of the wingwalls to the back of abutment which will be constructed in suitable fill infilling concrete walls. In accordance with TII 'Specification for Roadworks' (SRW), the backfill to the

abutments and between wingwalls will be compacted 6N1 material provided in accordance with Series 600 of the TII SRW.

The design of the proposed southern bridge abutment and approach ramp will accommodate access to the hotel and the marina gangway.

**Foundations and Substructures**

The foundations for the boardwalk structure are proposed to be driven steel tubular sections which will be installed to immediately beneath the soffit level of the boardwalk deck where an integral connection will be made. Cathodic protection systems will be installed to the steel tubular columns for corrosion protection. These supports will be placed at 15.0m centres. The north and south landings for the boardwalk will consist of reinforced concrete abutments where bearings will be provided for the deck.

**Superstructure**

The superstructure comprises two No. 2.0m high steel longitudinal girders which will be the main structural elements of the superstructure and additionally be the main parapet provision for the deck. Transverse steel plate girder will span between the longitudinal girders directly support the deck. The boardwalk deck is proposed to consist of perforated aluminium plates which will allow the deck to drain and also provide slip resistance for pedestrians and cyclists.

**Articulation Arrangements, Joints and Bearings**

The proposed structure is articulated at end supports and integral at pier locations. Mechanical bearings are proposed under each longitudinal steel girders at each end of the bridge. Longitudinal restraint to the bridge deck is provided at piers. The bearings will be sliding guided or unguided bearings. In particular, free sliding and guided bearings are proposed at each end support.

Stadiaflex type or equivalent finger expansion joints will be provided at each abutment.

**Parapets**

The proposed bridge incorporates edge beams which extend to 1.4m above deck level. This will provide edge protection for cyclists and pedestrians. The upstand includes a continuous handrail at a height of 900mm above deck level. The protection is extended to the bottom of ramp level at the end of the bridge using a concrete upstand of equivalent height.

A parapet is proposed around the full extent of the sea wall which will close to the bridge as appropriate.

**Drainage**

The proposed bridge will incorporate a porous free draining surfacing units. Normal access onto the bridge will be restricted to cyclists and pedestrians via demountable bollards located at the end of the bridge. Drainage channels are envisaged along the solid ramp approached to the bridge.





**Inspection and Maintenance**

All structures require regular inspections and routine maintenance during their life. Such inspections and maintenance should be carried out in accordance with Wexford County Council's standard procedures.

The proposed structure can be designed to achieve the required 120 year design life. In addition, the specification of suitable materials will enhance durability and reduce the maintenance liability. The following measures are proposed:

- Durable concrete to be provided in accordance with BD 57;
- Exposed concrete to be surface impregnated and buried concrete surfaces to be waterproofed in accordance with the TII Specification for Road Works;
- Stainless steel reinforcement to be provided in elements that are subject to de-icing salts and that are particularly vulnerable;
- Demountable decking units are proposed which can be easily removed to access structural steelwork for maintenance purposes;
- Exposed formed concrete surfaces to be F4 / F3;

**Design Loading**

The boardwalk will be designed for loading in accordance with IS EN 1991 Eurocode 1: Actions on Structures in particular Part 1-1 – General Actions, Part 1-3 Snow Loads, Part 1-4 Wind Actions, Part 1-5 Thermal Actions, Part 1-7 Accidental Actions and IS EN 1991 Part 2 Traffic Loads on Bridges as amended by the relevant Irish National Annexes.

This boardwalk structure is not considered as a 'large footbridge' requiring the development of project specific load models. Load models in accordance with IS EN 1991-2 are appropriate. LM4 (crowd loading) is considered applicable at this location and in accordance with section 5 of IS EN 1991-2 and the National Annex consists of a uniformly distributed load (qfk) of 5kN/m2 and a concentrated load (Qfwk).

Appropriate surcharge loading will be applied to the piled structural ramps behind each abutment.

Impact loading will be considered due to floating debris and current and wave action will be addressed in the design both on column supports in the temporary free cantilevered condition and on the deck in the permanent condition.

**Departures form Standard**

No departures from standard are proposed at the time of writing of this report.

**Structural Analysis**

The structure shall be modelled in 3D and designed by means of linear elastic analysis using MIDAS structural analysis software. Finite Element Methods of Analysis (FEM) using MIDAS may also be used to analyse local effects.

Loading will be applied and combined in accordance with IS EN 1990 and IS EN 1991 as amended by the relevant National Annex for both ultimate and serviceability limit states. Horizontal forces on footbridges in accordance with Clause 5.4 of IS EN 1991-2 are considered as acting simultaneously with the corresponding uniformly distributed vertical load (qfk), but not with the concentrated load (Qfk). Additional activities i.e., Mass gathering, deliberate pedestrian synchronisation and vandal loading will be considered at detailed design stage.

Structural Steelwork will be designed in accordance with IS EN 1993 as amended by the Irish National Annex. Second Order effects will be analysed in accordance with Clause 6.3 of IS EN 1993-1 using appropriate buckling lengths according to the global buckling mode of the structure. In addition to static loading models, alternative dynamic models representing single pedestrians and pedestrian groups will be generated and analysed at detailed design stage in accordance with IS EN 1991-2 and the relevant National Annex. This will include a natural frequency (eigenvalues) analysis to determine the natural frequencies and mode shapes (normalised to mass) for use in the vibrational assessment of the footbridge.

This bridge will be designed for Bridge Class D "Primary access to major assembly facilities such as sports stadia or major public transportation facilities" in accordance with Clause NA 2.46.2 of the National Annex to IS EN 1991-2 which recommends a crowd density of 1.5persons/m2 with a likely group size of N=16 and a jogging group size of N=4. The relevant dynamic response modifiers have been determined and set out in **Table 3.2**.

**Table 3.2 Response Modifiers**

| | k1 (Site usage) | k2 (Route Redundancy) | k3 (Structure height) | k4 (Exposure Factor) |
|---|---|---|---|---|
| Dynamic Response Modifiers | 0.8 | 1.0 | 1.0 | 1.0 |

The foundations will be designed in accordance with IS EN 1997 (Approach 1 Clause 2.4.7.3.4.1 (1)) and IE EN 1992 as amended by Irish National Annex. Geotechnical displacements and rotations will be confirmed on receipt of the factual geotechnical report following the site investigations.

Structural Concrete will be designed and detailed in accordance with IS EN 1992 as amended by the Irish National Annex.

**Differential Settlements**

Differential settlements will be considered during the detailed design stage. The foundation design will limit long term differential settlements to less than a 10mm and the deck structure will be analysed accordingly. These values are subject to review on receipt of the Detailed Geotechnical Investigation Report.





## 3.8 Marina

The marina is to be located off the northern corner of the Trinity Wharf Development site. The design of the marina includes creating a sheltered marina area with 64 berths by constructing a series of high-end pre-fabricated 5-metre-wide floating breakwaters with skirts that will be tethered to the seabed. This design means that no dredging is required to achieve the desired minimum operating depth of -2.5m CD, thus minimising potential environmental impacts.

It is proposed that the floating pontoons of the marina will be constructed using industry standard modular pontoon and finer units. Pontoon berths and walkways will be restrained using tubular piles driven into the seabed. An alternative method to this the use of helical anchors being drilled into the seabed which will connect and secure the pontoon berths and walkways. A single gangway that will be pivoted on the reclaimed deck and rested on the main walkway will provide access to the proposed marina area.

The location of the proposed marina has been selected to minimise navigational restrictions within the existing approach channel to Wexford Harbour, minimise sedimentation and impacts on the shellfishery industry. See drawings No. TRWH-ROD-GEN-SW_AE-DR-CH-4091, 4092 & 4093 for details of the marina.

The following services will be provided to the marina:

**Water**

Potable water will be supplied to the proposed marina development from the proposed landside development via the underside of the access bridge and service channels along the marina pontoons.

Based on marina of similar sizes around Ireland, it is estimated that the potable water supply for the new marina facility at Trinity Wharf will be as follows:

- Less than 1m3 per hour at peak demand in summer
- Peak of 3m3 for daily usage in summer
- Peak of 1m3 for daily usage in winter

**Sewerage Infrastructure**

Waste from the designated waste pump-out station will be ejected through a weighted pipe by high pressure ejector system into sewage infrastructure of the proposed landside development. The weighted pipe will rest on the seafloor and enter the landside sewage infrastructure through the sheet piled perimeter of the site.

**Electricity**

The proposed marina development will be supplied with electricity from the local network provider. The pontoons will have individual electricity service pedestals and will be fed from the local electricity supply via the underside of the access bridge and service channels along the marina pontoons. There is provision within the proposed landside Trinity Wharf development to accommodate the power supply without causing disruption to other users.

**Navigation**

Solar powered navigation aids will be positioned on the new infrastructure within the marina. The exact characteristics (i.e. colour and flash frequency) of these navigation aids will be specified in accordance with the requirements of the Commissioners of Irish Lights

**Design**

The feasibility and preliminary stage designs of the marina were advanced in parallel with the overall scheme development for Trinity Wharf. The feasibility design is documented in separate reports issued under separate cover. The feasibility stage development included computational modelling of marine hydrodynamics, spectral wave assessment and sedimentation transport modelling. Extreme water levels and wave characteristics were predicted as part of the process.

The Irish Coastal Protection Strategy Study (ICPSS) states that there are no significant interactions of tidal currents and surges. Anecdotal evidence suggests that during frequent easterly wind conditions, the tidal levels in the Harbour do not drop during ebb flow (ICPSS Phase 2 South East Coast).

The feasibility study completed Wexford County Council for the Trinity Wharf Site in January 2018 builds on the works undertaken as part of the ICPSS and South Eastern CFRAMs where extreme sea levels and wave action were examined.

The two wave height acceptance thresholds used in the study were based on guidelines published by the Yacht Harbour Association and the Australian Standard (AS3962) Guidelines for design of Marinas. The assessment concluded that for the marina to be viable and safe, a suitably designed defence structure would be required. The study calculated a 1 in 50 year significant wave height of 0.9m and a 1 in 200 year significant wave height of 1.2m. The simulated wave height is significantly reduced by the implementation of defences such as breakwaters.

Four design options were shortlisted and Option 2 the 'Floating breakwater on the North Eastern Corner' of the Wharf was advanced for preliminary design.

The design of the marina will be advanced in accordance with the requirements of BS6349 Maritime Works and the guidelines published by the Yacht Harbour Association and the Australian Standard (AS3962) Guidelines for design of Marinas

As part of the preliminary design, the modelling was updated to take account of design developments landside including the use of a sheet pile sea wall over much of the east facing extent of the wharf.





## 4. DESIGN CODES AND STANDARDS

The civil engineering works presented in this report and the accompanying drawings have been designed in accordance with the following codes of practice and standards:

- The Design Manual for Urban Roads and Streets;
- Eurocodes;
- CIRIA Guide, The Use of Rock in Hydraulic Engineering;
- Eurotop, Manual on Wave Overtopping and of sea defences and related structures;
- TII Design Manual for Roads and Bridges
- BS6349 Maritime Works.

A detailed list of the relevant standards in included in Appendix A to this report.

The design has been subject to a Stage 1 Road Safety Audit, which is included in Appendix to the Traffic Impact Assessment Report.

## 5. MATERIALS

This section provides details of the materials proposed for incorporation into the design. It should be read to be read in conjunction with drawing TRWH-ROD-GEN-SW_AE-DR-CH-4091 and the Landscape Design Statement.

Structural Concrete

- Pile caps: Class C35/45.
- Pad foundations – C35/45;
- End supports – C40/50;
- Buildings superstructure: C35/45
- Reinforcement Grade B500B or B500C.

Concrete Exposure Classes and Cover

The proposed exposure classes of structural concrete elements are presented in Table 5.1 below.

**Table 5.1 Exposure Classes**

| Element | Exposure Class | Cover Cnom | Grade |
|---|---|---|---|
| Foundations | XC2, XA2, AD2, XS1, XS3 | 60 | 35/45 |
| Abutments, wingwalls, capping beams | XC4, XD2, XA1, XF2, XS1, XS3 | 60 | 40/50 |
| Columns, beams, slabs | XC1, XC3, XF1 | 35 | 35/45 |

Exposed in situ structural concrete in civil engineering structures will include 50% GGBS cement replacement.

Finishes

The proposed finishes to structural concrete elements are as follows except where a specific architectural finish is specified:

- Buried formed surfaces – F1;
- Buried unformed surfaces – U1;
- End supports unburied – Patterned profile finish.

Structural Steel

Structural steel to comply with I.S. EN 10210-1:2006 grade S335J2H or I.S. EN 10025:2004 grade S355J2 for rolled sections, and S355NL for structural connection plates exceeding 55mm thick. All closed sections will be sealed against corrosion.

The structural steelwork corrosion protection system will be specified to comply with the requirements of SRW Series 1900 for marine structures with difficult access.

Subject to detailed ground investigation and further consultation with Wexford County Council, the following construction is anticipated for the Paved Areas:





- Polymer Modified Stone Mastic Asphalt Surface Course (40mm)
- Dense Bitumen Macadam Binder Course (60mm)
- Dense Bitumen Macadam Road Base (150mm)
- Sub-base (150mm)
- Capping (350mm subject to CBR testing)

The following construction is proposed for the footpaths to allow occasional trafficking:

- Concrete or granite flagstones (63mm)
- Bedding mortar (37mm)
- Concrete sub-base (125mm)
- Sub-base (100mm)

All kerbs will be granite set in concrete. Details of the construction of the landscape / SUDS / tree pit areas are shown in detail on the accompanying drawings.

An overall palette of materials and finishes is proposed for Trinity Wharf that responds and reflects to its waterfront location, including those for the boardwalk, sea wall and water's edge that relate to and enhance the context and setting of the development.

For buildings this generally consists of:

- Pale white polished reconstituted stone panelling system;
- Glazing System with PPC Aluminium Framing, Ventilation Louvres and Brise Soleil (Colour RAL 7006: Beige-Grey);
- Louvres and Rood Plant Enclosures- PPC Aluminium (Colour RAL 7006: Beige-Grey); and
- Glazed Balconies to Apartments.

As stated above, a rippled bronze-coloured, high-quality light-weight screen cladding system is proposed for the car park building.

Sea walls are generally of sheet-piles with reinforced concrete coping. They are clad with precast concrete panels around the base of the boardwalk landing point to Trinity Wharf and along the hotel terrace. It is proposed to screen the sheet piling with rock armour along the northern wharf boundary between the railway embankment and hotel terrace. Where exposed, the sheet-piling is to have a durable paint finish (Colour RAL 7031: Blue-Grey).

The boardwalk is to be of painted structural steel (RAL9006: White aluminium). The upright inner surfaces are to be lined and decked with either a timber finish or a poured resin surface (RAL Colour: 8004: Copper brown). The deck is to porous incorporate proprietary aluminium decking units.

# 6. SERVICES

## 6.1 Water Supply

Water supply to buildings will be via a 150mm diameter watermain located adjacent to the main internal road of the site. The watermain will be connected to the main public network at Trinity Street via the main access road to the site. The exact details of the connection and extent of the upgrade works required are yet to be finalised by Irish Water. Refer to drawing TRWH-ROD-GEN-SW_AE-DR-CH-4066 for details.

## 6.2 Foul Drainage

A preliminary investigation of site constraints indicates that the foul waste from the site will be required to be pumped to the public wastewater infrastructure. Foul effluent will discharge from the proposed buildings by gravity to a large-scale public underground pumping station located at the north-west corner of the development site adjacent to the access road. Here wastewater will ultimately be pumped to the existing public combined sewer network. The pumping station has been designed to provide 24-hour effluent storage in case of failure. Standby pumps will also be provided.

In addition, a class II petrol interceptor will be located beneath the multi-storey carpark ground floor slab together with a pumped manhole in order to convey detergent runoff from the carpark cleaning operations to the foul drainage network. Refer to drawing TRWH-ROD-GEN-SW_AE-DR-CH-4065 for details.

## 6.3 Flood Risk Assessment and Proposed Drainage Layout

The flood risk of the proposed development has been assessed as part of this study. Previous flood studies have been undertaken as part of the national Preliminary Flood Risk Assessment (PFRA), the Catchment Flood Risk Assessment and Management (CFRAM) Programme, the Irish Coastal Protection Strategy Study (ICPSS) and the Wexford Town and Environs Development Plan 2009 – 2015 (as extended).

The flood risk of the proposed development has been assessed as part of this study. Previous flood studies have been undertaken as part of the national Preliminary Flood Risk Assessment (PFRA), the Catchment Flood Risk Assessment and Management (CFRAM) Programme, the Irish Coastal Protection Strategy Study (ICPSS) and the Wexford Town and Environs Development Plan 2009 – 2015 (as extended).

As required by the EU Floods Directive, the OPW carried out a PFRA to identify areas where the risk of flooding may be significant. The PFRA is a broad scale assessment based on historic flooding, predictive analysis and consultation with local communities and experts. As part of the PFRA, maps of the country were produced showing the indicative fluvial, pluvial and tidal flood extents. Areas for Further Assessment (AFA's) were identified.

The PFRA map at the proposed development location indicates that the site is located within the 1 in 200 year and extreme coastal flood extents. There is no





indication of groundwater flooding within the vicinity of the site, however there is indications of pluvial flooding, immediately south east of the development site. The PFRA mapping shows the 1 in 100 year and extreme pluvial flood extents immediately to the south east of the site.

Following on from the PFRA study, the OPW commissioned The South Eastern CFRAM Study Flood Risk Review which highlighted Wexford as an AFA for fluvial and Coastal flooding. This was based on a review of historic flooding and the extents of flood risk determined during the PFRA study. The Wexford town AFA incorporates the River Slaney and its associated tributaries.

The published final CFRAM (20/04/2017) fluvial mapping indicates that the development site is within the 1 in 10 year, 1 in 100 year and 1 in 1000 year fluvial flood extents. The site also lies within the 1 in 10 year, 1 in 200 year and 1 in 1000 year tidal flood extents, as indicated on the final CFRAM (18/07/2018) tidal mapping.

The Irish Coastal Protection Strategy Study (ICPSS) is a national study that was commissioned in 2003 with the objective of providing information to support decision making about how best to manage risks associated with coastal flooding and coastal erosion.

The published tidal flood extent mapping indicates that the development site is within the 1 in 200 year and 1 in 1000 year tidal flood extents.

No flood risk assessment was undertaken as part of the Wexford Town and Environs Development Plan however, policy statements SW6-SW11 relate to flood risk in the planning document. The plan stipulates that floor levels of all buildings must be 300mm above the 1 in 100 year fluvial or 1 in 200 year tidal flood level.

**Flood Risk**
The development site is located within Flood Zone A. The OPW "The Planning System and Flood Risk Management – Guidelines for Planning Authorities" (The Guidelines), 2009 states that for Flood Zone A, the probability of flooding from rivers and the sea is highest (greater than 1% or a 1 in 100 return period for river flooding or 0.5% or a 1 in 200 year return period for coastal flooding). As a result of the proposed development, there will also be an increase in impermeable areas on the site, as mentioned above.

Flood risk assessments at strategic and site specific scale have been undertaken as part of the following studies:

- Irish Coastal Protection Strategy (ICPSS);
- The South Eastern CFRAMs and;
- Wexford County Council Trinity Wharf Marina Project – Feasibility Study.

Extreme sea level return periods detailed in these studies are listed in Table 6.1 below.

**Table 6.1 Calculated sea Water Levels (WL) (all figures include a climate change factor as per the OPW MRFS)**

| Study | 1 in 200 year WL (mOD) | 1 in 200 year WL (mOD) + 300mm | 1 in 1000 year WL (mOD) |
|---|---|---|---|
| Irish Costal protection Strategy Study | 2.24 | 2.54 | 2.47 |
| South Eastern CFRAMs | 2.14 | 2.44 | 2.32 |
| Wexford County Council Trinity Wharf Marina Project - Feasibility Study - RPS | 2.34 | 2.64 | 2.56 |

The highest values among the various flood studies (Table 6.1) were calculated as part of the Wexford County Council Trinity Wharf Marina Project – Feasibility Study. As per the precautionary approach, these are considered the most suitable indicators of flood risk prior to a detailed flood risk assessment of the Proposed Development being undertaken. The impact associated with flooding during the operational stage in the absence of appropriate mitigation is deemed to be moderate to significant.

**Proposed Surface Water Drainage**

The surface water drainage for the development site comprises a Sustainable Drainage System (SuDS) based approach. This consists of blue/green roofs for all buildings, raingardens at the perimeter of buildings, bio-retention areas and swales/basins in soft landscaped areas and permeable paving on hardstanding areas.

The permeable paving will require regular maintenance. The provision of permeable paving within the development will negate the need to provide multiple petrol interceptors throughout the development. Treatment to runoff generated will be provided within the pavement layers through the processes of filtration, biodegradation, adsorption of pollutants and the settlement and retention of solids within the pavement layers.

The SuDS approach offers greater flexibility for the scheme and minimises the need for costly remediation. The drainage network will attenuate and cleanse the surface water runoff from the site prior to discharge to the sea through a diffuse system or point discharge.

The surface water drainage network will drain by diffuse infiltration to ground and will be designed to store the 1 in 100-year 6-hour rainfall event plus climate change (between tidal cycles). It is proposed that a 250mm layer of compacted clay will be placed beneath all paving and landscape fill areas, as a semi impermeable barrier to prevent the infiltration of rainwater to underlying subsoil. Some limited infiltration will ultimately still occur, but this will represent a small fraction of total effective rainfall. Refer to drawing TRWH-ROD-GEN-SW_AE-DR-CH-4064 for details.

## 6.4 Public Lighting

External lighting posts are proposed to be installed along the internal road, pedestrian and cycleway network of the site.

Hess Linea LED Levo3 Double Displaced lighting columns are proposed to be located along the entrance and main access road into the site, as well as around the central public space area.





Hess Linea LED Levo3 Single lighting units are proposed to mark the shared road/cycleway internal road network.

Hess Linea LED Lighting bollards are proposed to delineate the pedestrian/cycleway pathways around the site.

Hess Ledia LL Illuminating Strips are proposed to be installed along the boardwalk surfaces, along the edge of the deck and around the hotel bar terrace.

Refer to the architects' public lighting drawing for details.

## 6.5 Energy Supply

The following describes the proposed servicing strategy for each of the buildings which has been designed in compliance with the incoming Near-Zero Energy Building (NZEB) standard which requires a reduction of at least 60% below the Part L 2008 benchmark with 20% of energy being derived from renewable sources.

**Hotel**

The proposed servicing strategy for the Hotel buildings comprises of the following systems:

- Heating is proposed to public areas and bedrooms using Variable Refrigerant Flow (VRF) air source heat pumps;
- Heating will be provided to other areas with condensing natural gas boiler and radiator system;
- Hot water is proposed to be heated by a highly efficient natural gas 100 kWe (with heat to power ratio of 1.3) Combined Heat and Power Plant (CHP) with insulated storage tanks incorporated in the system;
- Cooling will be provided by air source heat pumps and chillers for ventilation cooling/dehumidification;
- Ventilation will be provided by mechanical ventilation with heat recovery to all public and back of house areas;
- Constant air volume mechanical ventilation is proposed for kitchen areas with dedicated exhaust;
- Centralised extract ventilation will be provided to ensuite bathrooms;
- Natural ventilation will be used to ventilate bedrooms and circulation areas;
- Lighting will be provided by highly efficient LED luminaries in conjunction with occupancy control and photocell dimming controls; and
- Renewable energy contribution will be provided through the use of Combined Heat and Power plant (CHP) for hot water consumption.

**Cultural Centre**

The proposed servicing strategy for the Cultural Centre comprises of the following systems:

- Heating and hot water will be provided to all areas with condensing natural gas boilers with ventilation systems to conference room and a radiator system to other areas;
- Cooling will be provided by cooled chiller;
- Mechanical Ventilation with cooling and plate heat exchanger for recovery will be provided to the conference room, stage area and exhibition spaces;
- Mechanical Ventilation with heat recovery will be provided to changing rooms and staff areas.
- Constant air volume mechanical ventilation is proposed for kitchen areas with dedicated exhaust;
- Localised individual extract will be provided to small toilets;
- Natural ventilation will be used to ventilate studios, exhibition space. Office and back of house areas;
- Lighting will be provided by highly efficient LED luminaires with occupancy control and photosensitive diming controls;
- Renewable energy contribution will be provided by photovoltaic (PV) solar panels.

**Café, Retail and Restaurant**

The proposed servicing strategy for the Café, Retail and Restaurant buildings comprise of the following systems:

- Heating will be provided to all areas with a highly efficient natural gas boiler and radiator system;
- Hot water is proposed to be heated by a highly efficient natural gas boiler and insulated storage calorifiers;
- It is envisaged that cooling will not be provided to the restaurant or café.
- A natural ventilation strategy is proposed for ventilation of Café and restaurant areas;
- Constant air volume mechanical ventilation is proposed for kitchen and servery areas with dedicated exhaust fans;
- Localised individual extract is proposed for toilets;
- Lighting will be provided by highly efficient LED luminaires with occupancy control and photocell diming controls;
- Renewable energy contribution will be provided by 150m2 photovoltaic (PV) solar panels; and
- Retail Space to be provided as shell and core, with 15m2 photovoltaic array to meet envisaged NZEB requirement in accordance with guidance within Part L 2017.

**Office Types A, B and C**





The proposed servicing strategy for the Office buildings comprise of the following systems:

- Heating will be provided to office areas with 4-pipe fan coil units with a condensing natural gas boiler and radiator system to ancillary areas;
- Hot water is proposed to be heated by a highly efficient natural gas boiler and insulated storage system;
- Cooling will be provided by air cooled chillers;
- Ventilation will be provided to all office areas by mechanical ventilation with heat recovery using fan coil units for temperature control;
- Constant air volume mechanical ventilation is proposed for toilets;
- Localised individual extract will be provided to small individual toilets and storage areas;
- Natural ventilation will be used to ventilate core areas;
- Lighting will be provided by highly efficient LED luminaires with occupancy control and photosensitive diming controls; and
- Renewable energy contribution will be provided by Photovoltaic (PV) solar panels ranging between 100 – 120m2 for each of the three office blocks.

**Residential Apartment Building**

The proposed low energy and servicing strategy for the Apartment building comprise of the following systems:

- Improved Building Fabric and glazing Thermal Transmittance (U-Value) performance;
- Reduced Air permeability;
- Thermal Bridging to Accredited Construction Details (ACD);
- Heat Recovery Ventilation (HRV) to each apartment (individual system);
- Natural Ventilation to Landlord areas;
- Centralised heating and hot water provided by Air Source Heat Pumps (ASHP) with back-up natural gas fired boilers, via heat interface units HIU's);
- Air Source heat pumps predicted to provide 55% of annual heating and hot water demand;
- 100% Low Energy Lighting; and
- Renewable technologies – Air Source Heat Pumps for heating and hot water supplemented with landlord photovoltaic (PV) Array instillation, with 1 No. PV panel per apartment (60 No. Total / 100m² approx.)

Detailed information on the Energy Supply provisions for the proposed development are provided in the Engineering Services Report.

## 6.6 Gas Mains

The preliminary design has contemplated a natural gas supply being made available to the site. Initial consultations with Iarnród Éireann provide for a 150mm HDPE supply being carried underground from Trinity Street across the railway. Refer to Drawing No TRWH-ROD-SBR-SW_AE-DR-CB-4073. Provisions for gas supply will l be subject to further development at Detailed design stage.

### 6.7 Electricity

Provision has been made for electrical supply to the site to be carried underground from Trinity Street over the proposed railway level crossing. Consultation with ESB and the specialist designer has resulted in a provision of 2no 160mm diameter distribution ducts to accommodate a medium voltage supply entering the site. Separate 110mm uPVC ducting will be provided to accommodate public lighting.

### 6.8 Traffic Ducts

Cabling and power supply to traffic lights will be carried in duct under footpaths and proposed road crossings in accordance with the relevant TII RCD's.

### 6.9 Telecommunications

Provision has been made in the design for telecommunications services through 4No dedicated 110mm uPVC ducts to enter the site from Trinity Street within footpaths under the proposed level crossing.





## 7. ACCESS AND TRAFFIC CIRCULATION

### 7.1 Proposed Site Access

The proposed main access to the site will consist of a link road which will typically provide a 6m carriageway and 3m footpaths on both sides widening at the junction with Trinity Street for a right turn lane. The new access junction will form a 4-way signalised junction with Trinity Street and Seaview Avenue. See drawing No. TRWH-ROD-GEN-SW_AE-DR-CH-4072 Proposed Signalised Access Junction the plan of the junction.

The signalised junction will have two approach lanes on all arms. The junction geometry has been developed in accordance with the Department of Transport Design Manual for Urban Roads and Streets (DMURS) and the traffic signal layout is designed in accordance with the TII Design Manual for Roads & Bridges DN-GEO-03060 – Geometric Deign of Junctions. The proposed junction layout retains the on-street parking on the west side of the street except for approximately 3 spaces through the junction. Kerb buildouts on both sides of Sea View Avenue will reduce the distance for crossing pedestrians and improve visibility for vehicles pulling out of Sea View Avenue. See drawing No. TRWH-ROD-GEN-SW_AE-DR-CH-4073 for details.

The junction will primarily function on a four-stage cycle, including a stage for pedestrians. A fifth stage for Seaview Avenue will be incorporated into the cycle when a vehicle is detected on this leg via a vehicle activation device.

The proposed link road into the development site will form a new level crossing with the Dublin to Rosslare Railway Line. Iarnród Éireann have agreed in principal to the design of the level crossing which will consist of signalised CCTV controlled boom barriers. The barriers are expected to active for 3-minute intervals 8 times a day for passing trains at 05:56, 07:41, 12:08, 13:16, 16:09, 17:51, 19:18 and 21:12. (according to the current Irish Rail timetable). A service building will also be provided for personnel managing the operation of the level crossing.

The proposed level crossing will provide for a 10m wide carriageway and 3.0m pedestrian cycle ways on each side of the carriageway. Additional traffic lanes have been provided on the approaches to the proposed Trinity Street junction to address the anticipated traffic demands at peak times.

The boardwalk to be constructed between Paul Quay and Trinity Wharf provides a direct link to the Town Centre for pedestrians and cyclists. A consequence of the construction of this boardwalk will be the loss of approximately 21 car parking spaces on the southern end of Paul Quay where the approach ramp to the boardwalk is to be constructed.

The proposed pedestrian and cycling link is in-keeping with the following policy statements in the Wexford Town and Environs Development Plan;

- CW1 To continue the improvements, which facilitate pedestrian safety at various locations within the Town Centre
- CW2 To encourage the extension and widening of footpaths generally within the existing built up area.
- CW3 To continue to provide for and extend the system of safe pedestrian and cycle routes linking residential areas and the town centre with schools, shops, the train station and open spaces
- CW6 To ensure that roads and footpaths are designed and constructed to cater for the needs of the people with disabilities.

## 7.2 Internal Circulation

The public spaces and streets within the development are proposed as a pedestrian dominated public realm capable of holding outdoor events in the open spaces. The site will be permeable to pedestrians with footways provided on all desire lines. A 4m wide dual pedestrian / cyclist promenade will be provided on the north-east and south-east site boundaries with the coast. See drawing No. TRWH-ROD-GEN-SW_AE-DR-CH-4071 for details.

A large proportion of vehicular traffic accessing the site (approximately 90%) are expected to drive directly to the multi-story carpark which has been located adjacent to the Trinity Street entrance so that the majority of traffic does not need to enter or pass through the main public realm areas of the site.

The circular route through the development is proposed as a pedestrian priority shared surface and will cater for one-way vehicular traffic only. The one-way route is intended exclusively for service and emergency vehicles, hotel drop-off and traffic accessing the small number of surface car parking including accessibility bays. Vehicles intending to use the multi-storey carpark after making a drop off first can access the carpark via the one-way route. Low traffic speeds will be achieved with entry and exit ramps, use of traffic calming pavement, street furniture and landscaping and narrow carriageway widths with tight corner radii in accordance with DMURS.

## 7.3 Service and Emergency Vehicles

Heavy goods vehicle (HGV) accessibility through the development has been analysed using AutoTrack (see Drawing No. TRWH-ROD-GEN-SW_AE-DR-CH-4071) software to ensure service and emergency vehicles have access throughout the site including buildings, the marina and the promenade. The largest vehicle envisaged on the site is a 10m long rigid HGV.

## 7.4 Parking Provisions

The proposed development includes a multi-storey carpark with 462 spaces, including 23 accessible spaces. There will be 47 surface car parking spaces throughout the site which will include 8 accessibility spaces. This give a total onsite





parking provision of 509 spaces, of which 31 spaces or 6% will be designated for people with disabilities.

The primary components of the development requiring regular daily car parking provisions are the hotel, offices, apartments and cultural centre. The café/retail building is considered ancillary to the primary components. A provision of on-site car parking for the hotel and apartment complex is essential for the commercial viability of the development which will require a minimum dedication of 1 space per hotel bedroom and 1 space per apartment, which equates to 120 spaces for the hotel and 58 spaces for the apartments. The remaining 331 spaces will be available for dual use between the offices during business working hours and the cultural and performance building at the evenings and weekends. These 331 spaces will also accommodate visitors to the apartment complex. A Car Park Management plan will be prepared to maximise the potential of this dual use parking and this will include the use of parking permits and pay parking.

The construction of the new boardwalk will impact on approximately 21 no. parking spaces at the southern end of Paul Quay. The loss of these spaces is not considered critical as the nearby Sinnott Place multi-storey long-term car park currently has adequate capacity to facilitate the transfer of vehicles.

# 8. CONSTRUCTION MANAGEMENT

## 8.1 Construction Access

Currently the Trinity Wharf site is accessed via a small side road to the north west corner of the site. This access is locked with a gate to prevent the public accessing the railway line. Currently for any work required to be carried out on the site and for plant accessing the site, coordination is required with Iarnród Éireann for the gate to be unlocked, sleepers to be placed over the tracks and signal men to be in place for the duration of the operation.

The width of this access and the arrangements necessary for construction plant are inappropriate and as such the main permanent access will have to be established prior to commencement of any of the main construction works on the site. Similar arrangements to those described above are likely to be required during the construction phase until such time as the level crossing is operational, however this will be agreed with Irish Rail.

The design of the proposed development proposes the construction of a new access road leading from Trinity Street adjacent to McMahon Building supplies and a new permanent signal-controlled level crossing over the railway to be operated by Iarnród Éireann.

The construction of the road will therefore be the first construction works to take place with the demolition of the hard-standing area, structural walls, the excavation of the embankment immediately adjacent to the railway and the construction of the new approach road to the railway. Temporary works may be required to ensure the stability of the adjacent building during excavation and construction of the road. The road will then be connected to Trinity Street by the installation of a signal-controlled junction. As per the Japanese Knotweed management strategy, the area of Japanese Knotweed adjacent to these works will be managed by the Contractor during these works. Where eradication has not been achieved, further measures will be put in place by the Contractor to ensure no spreading of the invasive species occurs.

Following on, or continuing in parallel, with the construction of the road, a temporary level railway crossing will be established for the duration of the works. Towards the end of the construction phase, this crossing will be made permanent. Pavement works will have to be constructed on the railway and temporary accommodation arrangement for Iarnród Eireann flag man and look-out staff who will control the crossing for the duration of the works. Exact arrangements of this crossing will be agreed with Iarnród Eireann.





## 8.2 Construction Traffic Routes including Deliveries to Site and Removals from Site

Temporary traffic management measures will be required for the construction of the access road which connects to Trinity Street and for the installation of the signal-controlled junction at the interface between the two.

Upon completion of the access road, however, all construction activities will be contained to within the Trinity Wharf Development site and as such temporary traffic management will be limited to temporary arrangements or traffic controllers for assisting with the ingress of large vehicles, for large plant arrival, prefabricated structure arrival and crane arrival etc., at the Junction between the access road and Trinity Street.

## 8.3 Construction Working Hours

Except where otherwise agreed with Wexford County Council, the normal working hours are expected to be Monday to Friday between 07.00 and 19.00 hours and Saturday between 08.00 and 16.30 hours, with no working on Sundays and public holidays.

## 8.4 Demolitions and Excavations

Detailed structural assessments will be undertaken on all structures prior to their demolition. The Contractor will comply with the recommendations of the assessor(s). Should any asbestos materials be found on site, particular measures will be employed to comply with legislation in this regard.

Excavated Materials will be re-used on site or disposed of in accordance with the Waste Management Plan. Where contaminated materials are found on the site, specific measures will be taken for its safe excavation and disposal. site investigation is underway at the time of writing and will include extensive contaminant testing. The findings of this investigation will be used to inform the detailed design.

## 8.5 Welfare Facilities

The Contractor shall ensure adequate Welfare Facilities are provided in the Principal Site Offices, which shall include electricity and water supply, as well as connections to the public foul sewerage network.

## 8.6 Environmental Controls

The Contractor will be required to comply with best construction practice in terms of the control of noise, dust and vibration. Appropriate measures will be put in place to prevent discharge of contaminants to watercourses.

## 8.7 Construction Management Plan

Prior to any excavation or construction a Construction Management Plan (CMP) will be produced by the Contractor. A Construction Management Plan deals with the Contractor's overall management and administration of a construction project. A

CMP is prepared by the Contractor during the pre-construction phase, to ensure that the project is completed on-time and within budget. The CMP will include a detailed programme of works and budget. The CMP is also developed to ensure that all construction activities are undertaken in a satisfactory and safe manner, to a delivery program meeting the Clients requirements. The Contractor will be required to include details under the following headings:

1) Traffic Management Plan (to be developed in conjunction with the Local Authority – Roads Section) including details of routing of network traffic; temporary road closures; temporary signal strategy; routing of construction traffic; programme of vehicular arrivals; on-site parking for vehicles and workers; road cleaning; other traffic management requirements.
2) Working hours and days
3) Emergency Plan - in the event of fire, chemical spillage, cement spillage, collapse of structures or failure of equipment or road traffic incident within an area of traffic management. The plan must include contact names and telephone numbers for: Local Authority (all sections/departments); Ambulance; Gardaí and Fire Services.
4) Chemical/fuel storage areas (including location and bunding to contain runoff of spillages and leakages)
5) Construction plant storage, temporary offices and on-site chemical toilet areas
6) Truck wheel wash (including measures to reduce and treat runoff)
7) Dust Management Plan to prevent nuisance (demolition & construction)
8) Site run-off management
9) Noise and vibration management to prevent nuisance (demolition & construction)
10) Landscape management
11) Management of demolition of all structures and assessment of risks for same
12) Lighting details (construction & operation)
13) Signage
14) Stockpiles

### 8.8 Construction and Demolition Waste Management Plan

During the construction phase both solid and liquid waste will be produced at the site. Waste oils and solvents will be stored in a temporary bunded area prior to transport off site by a licensed contractor.

During the construction phase all domestic effluent generated on site will either:
a) be discharged to the public sewer network; or
b) discharged to temporary sewage containment facilities prior to transport and treatment off site by an authorised contractor.

All waste generated during the construction phase will be adequately segregated and stored prior to transfer to an authorised facility for recovery/recycling/disposal. Any contaminated ground that is encountered within the areas of made ground which has been excavated will be removed and disposed off-site. Contaminated soils will be





assessed, excavated, and disposed off-site in accordance with the Waste Management Acts, 1998-2006.

Should any asbestos materials be found in any structures to be demolished, particular measures will be required for the safe handling and disposal of same in accordance with best practice. See also Section 10.2.

## 9. ENVIRONMENTAL IMPACTS

Environmental impacts have informed the feasibility, design and engineering of the proposed development from inception stage to final design.

The Environmental Impact Assessment Report (EIAR) and associated Non-Technical Summary (NTS) provides information relating to the baseline environment and the assessment of likely significant impacts on the environment as a result of the proposed development. The environmental topics that are assessed in the EIAR include the following:

- Traffic;
- Population and human health;
- Biodiversity;
- Soils and Geology;
- Hydrogeology
- Hydrology
- Landscape and Visual
- Noise and Vibration
- Air quality and climate
- Archaeology and cultural heritage
- Material assets and land;
- Inter-relationships, major accidents and cumulative effects.

Surveys, assessments and information that form the basis of this EIAR are based on the current design of the proposed development which has been developed to a stage that permits a fully informed Environmental Impact Assessment. All likely significant environmental impacts have been identified and are addressed as part of the individual and cumulative assessment. Mitigation measures which are envisaged to avoid, prevent or reduce and if possible offset likely significant adverse effects of the proposed development are also included. It also details likely positive environmental effects as a result of the proposed development.

A **Natura Impact Statement** (NIS) has also been prepared owing to the nature and scale of the proposed development and its immediate proximity to a number of EU designated Natura 2000 sites.

Each of the above documents are included with the planning submission.





## 10. HEALTH & SAFETY

### 10.1 Risks to Safety and Health of Workers

The following is a list summarising those particular risks referred to in schedule 1 of the Safety, Health and Welfare at Work (Construction) Regulations 2006 which are considered relevant to the proposed works and are deemed to be reasonably foreseeable:

1. Work which puts persons at work at risk of **–**
2. Falling from a height,
3. Burial under earthfalls, or
4. Engulfment in swampland
5. Work which puts persons at work at particular danger from chemical or biological substances constituting a particular danger to the health and safety of such persons or involving a legal requirement for health monitoring;
6. Work with ionising radiation requiring the designation of controlled or supervised areas as defined in Directive 96/29/Euratom2;
7. Work near high voltage power lines.
8. Work exposing persons at work to the risk of drowning;
9. Work involving the assembly or dismantling of heavy prefabricated components.

The following is a non-exhaustive list of the work related to the project which will involve particular risks to the safety, health and welfare of persons in the construction of the works:

1. Working on or adjacent to public roads with live traffic, including rail traffic, which will involve risk of accidents due to conflict between road and rail vehicles/users/pedestrians and site vehicles/personnel;
2. Work involving provision of traffic management adjacent to the works (including provision for pedestrians and cyclists);
3. Work in the vicinity of trenches and deep excavations;
4. Working in the vicinity of, or adjacent to other construction contracts;
5. Working in the vicinity of existing watercourses (including the Slaney River Estuary);
6. Working adjacent to existing structures;
7. The Contract duration may require persons and plant to be working on site after daylight hours. Care and measures to prevent risk to persons should be put in place;
8. Work involving the use of heavy machinery, particularly road planing machines, road paving machines and asphalt delivery vehicles (including maintenance);
9. Working with contaminated materials Contaminated soils have been identified on the site. Detailed site investigations are ongoing in respect of the materials at the time of writing.;
10. Work in the vicinity of vehicles reversing on site;

11. Working with hot materials;
12. Work involving the presence of existing/new physical barriers which could impede or restrict movement in an adverse way;
13. Unauthorised access to the site by members of the public;
14. Working adjacent to existing utilities; includes buried utilities including gas pipes, water pipes and telecoms ducts, with the risk of explosion or flooding;
15. Mammal borne diseases;
16. Water borne diseases;
17. Work involving the use of substances which must be labelled with the risk phrases R45 "may cause cancer", or R49 "may cause cancer by inhalation" and where a risk assessment in accordance with regulation 4(b) of the Safety, Health and Welfare at Work (Carcinogens) Regulations, 2001 reveals a risk to safety or health. Substances classified as carcinogens include zinc chromate and certain classes of bituminous substances which are used in caulking or sealants;
18. Work involving the use of substances or preparations which must be labelled with the risk phrase R42 "may cause sensitisation by inhalation" and where a risk assessment in accordance with Regulation 4 of the Safety, Health and Welfare at Work (Chemical Agents) Regulations, 2001 reveals a risk to health. Substances classified as respiratory sensitisers include isocyanates. These are a component of many coatings, sealants and foams, particularly "two pack" coatings or urethanes;
19. Any other work activity involving the use of any chemical or biological agent where a risk assessment in accordance with Regulations 4 of the above mentioned 1994 Chemical Agents Regulations or Regulations 4 and 10 of the Safety, Health and Welfare at Work (Biological Agents) Regulations, 1994 reveals a risk to safety or health.
20. Work involving the handling, storage and disposal of asbestos materials.

The above list is non-exhaustive and represents those risks that have been identified during the design process, which could not practicably be eliminated by revising the design. In addition, it should be noted that a number of risks may arise out of working methods proposed by the Contractor and as such cannot be determined by the Designer.

### 10.2 Specific Measures for Reducing Particular Risks

It is envisaged at the commencement of the Design Phase that the following non-exhaustive list of specific measures for reducing particular risks will be addressed by the PSCS in the Construction Stage Safety and Health Plan:

1. Measures will be required for the safe handling and use of chemical or biological substances;
2. Measures will be required for the safe operation of plant working in the vicinity of medium voltage power lines (ESB cables);
3. The use of transport vehicles, and materials-handling shall be planned to conform with the following conditions:
    i. The stability of any temporary works shall be secured;





    ii. Provision of adequate lateral clearance for live traffic adjacent to works areas;
    iii. Sufficient clearances both laterally and vertically to achieve adequate working space shall be ensured for vehicles and machinery, especially in proximity to live traffic lanes, pedestrians and cyclists, so as not to trap or crush persons or cause damage or collapse of temporary platforms, trenches and the like;
    iv. Detailed traffic management plans with high visibility signs and temporary road markings, banksman/lookouts to be used for site traffic with full PPE worn by all staff;
    v. Particular measures for controlling construction traffic in the vicinity of the Railway Line;
    vi. Liaison with Wexford County Council Roadworks Control as appropriate.
4. Measures will be required for the safe operation of operatives working close to and in trenches, including provision of fencing to restrict access and shoring of trenches at locations of weak ground or deep trenches. The depth of some of the existing and proposed services is such that significant temporary works may be required for the retention of trench walls while works are being undertaken in or adjacent to the trenches;
5. Measures will be required to ensure the stability of existing structures while working adjacent to them, including structures to be demolished. The Contractor shall monitor structures while adjacent excavations are underway and shall take all necessary measures, including the design and construction of temporary works as required, to ensure their continued stability;
6. Measures will be required for the safe provision of temporary diversions of traffic, buses, cyclists, pedestrians and emergency services; close liaison will be required between the contractor and the road authority with adequate warnings and direction given to road users through signage. Work times should be adjusted to avoid peak flows;
7. Measures will be required for interfacing with other construction contracts;
8. Measures will be required to ensure the safety of plant and operatives working on, over, and in the vicinity of the River Slaney estuary, in particular to address the risk of drowning;
9. Measures will be required to ensure the safety of plant and operatives working at a height – adjacent to deep excavations;
10. Measures will be required for the monitoring of persons and plant working on site after daylight hours;
11. Measures will be required for the safe operation with clearance zones for plant adjacent to vehicular and pedestrian traffic. This will require the use of temporary barriers;
12. Measures will be required in the planning and delivery of asphalt and other materials to site, particularly given the proximity of the site to live traffic;
13. Equipment and clothing to protect against hot materials to be provided;
14. Measures will be required for handling contaminated soil materials, including their safe excavation, storage and disposal, including the provision of appropriate equipment and clothing to workers;

15. Measures will be required for the safe operation of operatives in the presence of physical barriers such as boundary walls, ditches, hedges and safety barriers which could impede or restrict movement in an adverse way;
16. Measures will be required for securing of the site and compound against unauthorised access and vandalism;
17. Measures will be required to locate the exact position of all public and private service utilities prior to excavation work commencing with continued liaison with service providers;
18. Measures will be required to prevent the contraction of mammal borne diseases;
19. Measures will be required to prevent the contraction of water borne diseases;
20. Measures will be required for the safe handling and use of any substance which must be labelled with a risk phrase or any substance/agent where a risk assessment is required to comply with Safety and Health legislation;
21. Measures will be required for the safe handling of heavy prefabricated elements;
22. Nuclear density gauges, which are a source of ionising radiation, may be used to test compaction of pavement layers. The Contractor shall take all necessary precautions and measures to ensure the training and protection of workers using such equipment and the protection of other persons in the vicinity.
23. Appropriate measures shall be put in place to ensure that site personnel and members of the public are not put at risk from any activities that may give rise to release of asbestos fibres.
24. Handling, storage and disposal of asbestos materials shall be undertaken in accordance with best industry practice.
25. Referring to the Safety, Health and Welfare at Work (Exposure to Asbestos) Regulations 2006, specific measures for reducing particular risks from exposure to asbestos are summarised in the following non-exhaustive list.
    i. Places in which exposure to dust arising from asbestos or materials containing asbestos takes places shall:
        - be clearly demarcated and indicated by warning signs
        - not be accessible to employees other than those who by reason of their work or duties are required to enter them
        - constitute areas where there should be no smoking
    ii. Areas shall be set aside where employees can eat and drink without risking contamination by asbestos dust.
    iii. With respect to all activities considered under this Schedule employers shall provide appropriate and adequate working or protective clothing and personal protective equipment so that –
        - such working or protective clothing and personal protective equipment must be kept within the place of work
        - such clothing, where not disposable, may be laundered outside of the place of work, subject to those facilities being equipped for this work and having assessed the risk related to such an action, taking account of the





transport and packing of items for laundering in suitable containers which are securely closed and labelled properly
        - separate storage spaces are provided for working or protective clothing and personal protective equipment and for street clothing
        - employees are provided with appropriate and adequate washing and toilet facilities, including showers
        - a well-defined place is provided for the storage of personal protective equipment
        - personal protective equipment shall be checked and cleaned after each use and before placing in dedicated storage area
        - appropriate measures shall be taken to repair or replace defective equipment before further use
26. Driven piling operations on land and over tidal open water;
27. Marine Works;

# Appendix A

# Relevant Design Standards





## Relevant Design Standards

**1.1 Eurocodes**

1.1.1. IS EN 1990:2002 Eurocode 0: Basis of structural design
NA to IS EN 1990:2002 Irish National Annex to Eurocode 0 Basis of structural design

1.1.2. i) IS EN 1991-1-1:2002 Eurocode 1: Actions on structures. General Actions. Densities, self-weight, imposed load for buildings

NA to IS EN 1991-1-1:2002 Irish National Annex to Eurocode 1: Actions on structures. General Actions. Densities, self-weight, imposed load for buildings

ii) IS EN 1991-1-3:2003 Eurocode 1: Actions on structures. General Actions. Snow loads

NA to IS EN 1991-1-3:2003 Irish National Annex to Eurocode 1: Actions on structures. General Actions. Snow loads

iii) IS EN 1991-1-4:2005 Eurocode 1: Actions on structures. General Actions. Wind actions

NA to IS EN 1991-1-4:2005 Irish National Annex to Eurocode 1: Actions on structures. General Actions. Wind actions

iv) IS EN 1991-1-5:2003 Eurocode 1: Actions on structures. General Actions. Thermal actions

NA to IS EN 1991-1-5:2003 Irish National Annex to Eurocode 1: Actions on structures. General Actions. Thermal actions

v) IS EN 1991-1-6:2005 Eurocode 1: Actions on structures. General Actions. Actions during execution

NA to IS EN 1991-1-6:2005 Irish National Annex to Eurocode 1: Actions on structures. General Actions. Actions during execution

vi) IS EN 1991-1-7:2006 Eurocode 1: Actions on structures. General Actions. Accidental actions

NA to IS EN 1991-1-7:2006 Irish National Annex to Eurocode 1: Actions on structures. Part 1-7 : Accidental actions

vii) IS EN 1991-2:2003 Eurocode 1: Actions on structures. Traffic loads on bridges

NA to IS EN 1991-2:2003 Irish National Annex to Eurocode 1: Actions on structures. Traffic loads on bridges

1.1.3. i) IS EN 1992-1-1:2005 Eurocode 2: Design of concrete structures– Part 1-1: General rules and rules for buildings

NA to IS EN 1992-1-1:2005 Irish National Annex to Eurocode 2: Design of concrete structures – Part 1-1: General rules and rules for buildings

ii) IS EN 1992-2:2005 Eurocode 2: Design of concrete structures – Part 2: Concrete bridges – Design and detailing rules

NA to IS EN 1992-2:2005 Irish National Annex to Eurocode 2: Design of concrete structure – Part 2: Concrete bridges – Design and detailing rules

iii) IS EN 1992-3:2006 Eurocode 2: Design of concrete structures – Part 3: Liquid retaining and containment structures

1.1.4. i) IS EN 1993-1-1:2005 Eurocode 3: Design of steel structures – Part 1-1 General rules and rules for buildings

NA to IS EN 1993-1-1:2005 Irish National Annex to Eurocode 3: Design of steel structures – Part 1-1 General rules and rules for buildings

ii) IS EN 1993-1-3:2006 Eurocode 3: Design of steel structures – Part 1-3 General rules – Supplementary rules for cold-formed members and sheeting

NA to IS EN 1993-1-3:2006 Irish National Annex to Eurocode 3: Design of steel structures – Part 1-3 Supplementary rules for cold-formed members and sheeting

iii) IS EN 1993-1-4:2006 Eurocode 3: Design of steel structures – Part 1-4 General rules – Supplementary rules for stainless steels

NA to IS EN 1993-1-4:2006 Irish National Annex to Eurocode 3: Design of steel structures – Part 1-4 Supplementary rules for stainless steels

iv) IS EN 1993-1-5:2006 Eurocode 3: Design of steel structures – Part 1-5 Plated structural elements

NA to IS EN 1993-1-5:2006 Irish National Annex to Eurocode 3: Design of steel structures – Part 1-5 Plated structural elements

v) IS EN 1993-1-6:2007 Eurocode 3: Design of steel structures – Part 1-6 Strength and stability of shell structures

NA to IS EN 1993-1-6:2007 Irish National Annex to Eurocode 3: Design of steel structures – Part 1-6 Strength and stability of shell structures (under preparation at the time of publication of this document)

vi) IS EN 1993-1-7:2007 Eurocode 3: Design of steel structures – Part 1-7 Plated structures subject to out of plane loading

NA to IS EN 1993-1-7:2007 Irish National Annex to Eurocode 3: Design of steel structures – Part 1-7 Plated structures subject to out of plane loading

vii) IS EN 1993-1-8:2005 Eurocode 3: Design of steel structures – Part 1-8 Design of joints

NA to IS EN 1993-1-8:2005 Irish National Annex to Eurocode 3: Design of steel structures – Part 1-8 Design of joints

viii) IS EN 1993-1-9:2005 Eurocode 3: Design of steel structures – Part 1-9 Fatigue

NA to IS EN 1993-1-9:2005 Irish National Annex to Eurocode 3: Design of steel structures – Part 1-9 Fatigue

ix) IS EN 1993-1-10:2005 Eurocode 3: Design of steel structures – Part 1-10 Material toughness and through-thickness properties





NA to IS EN 1993-1-10:2005 Irish National Annex to Eurocode 3: Design of steel structures – Part 1-10 Material toughness and through thickness properties

x) IS EN 1993-1-11:2006 Eurocode 3: Design of steel structures – Part 1-11 Design of structures with tension components

NA to IS EN 1993-1-11:2006 Irish National Annex to Eurocode 3: Design of steel structures – Part 1-11 Design of structures with tension components

xi) IS EN 1993-1-12:2007 Eurocode 3: Design of steel structures – Part 1-12 Additional rules for the extension of EN 1993 up to steel grades S 700

NA to IS EN 1993-1-12:2007 Irish National Annex to Eurocode 3: Design of steel structures – Part 1-12 Additional rules for the extension of EN 1993 up to steel grades S 700

xii) IS EN 1993-2:2006 Eurocode 3: Design of steel structures – Part 2 Steel bridges

NA to IS EN 1993-2:2006 Irish National Annex to Eurocode 3: Design of steel structures – Part 2 Steel bridges

xiii) IS EN 1993-5:2007 Eurocode 3: Design of steel structures – Part 5 Piling

NA to IS EN 1993-5:2007 Irish National Annex to Eurocode 3: Design of steel structures – Part 5 Piling

1.1.5. i) IS EN 1994-2:2005 Eurocode 4: Design of composite steel and concrete structures – Part 2 General rules and rules for bridges

NA to IS EN 1994-2:2005 Irish National Annex to Eurocode 4: Design of composite steel and concrete structures – Part 2 General rules and rules for bridges

1.1.6. i) IS EN 1995-1-1:2005 Eurocode 5: Design of timber structures – Part 1-1 General – common rules and rules for buildings

NA to IS EN 1995-1-1:2005 Irish National Annex to Eurocode 5: Design of timber structures – Part 1-1 General – common rules and rules for buildings

ii) IS EN 1995-2:2005 Eurocode 5: Design of timber structures – Part 2 Bridges

NA to IS EN 1995-2:2005 Irish National Annex to Eurocode 5: Design of timber structures – Part 2 Bridges

1.1.7. i) IS EN 1996-1-1:2005 Eurocode 6: Design of masonry structures – Part 1-1 General rules for reinforced and unreinforced masonry structures
NA to IS EN 1996-1-1:2005 Irish National Annex to Eurocode 6: Design of masonry structures – Part 1-1 General rules for reinforced and unreinforced masonry structures

ii) IS EN 1996-2:2006 Eurocode 6: Design of masonry structures – Part 2 Design considerations, selection of materials and execution of masonry

NA to IS EN 1996-2:2006 Irish National Annex to Eurocode 6: Design of masonry structures – Part 2 Design considerations, selection of materials and execution of masonry

iii) IS EN 1996-3:2006 Eurocode 6: Design of masonry structures – Part 3 Simplified calculation methods for unreinforced masonry structures

NA to IS EN 1996-3:2006 Irish National Annex to Eurocode 6: Design of masonry structures – Part 3 Simplified calculation methods for unreinforced masonry structures

1.1.8. i) IS EN 1997-1:2005 Eurocode 7: Geotechnical design – Part 1 General rules

NA to IS EN 1997-1:2005 Irish National Annex to Eurocode 7: Geotechnical design – Part 1 General rules

ii) IS EN 1997-2:2007 Eurocode 7: Geotechnical design – Part 2 Ground investigation and testing

~~1.1.9. i) IS EN 1998-1:2005 Eurocode 8: Design of structures for earthquake resistance - Part 1 General rules, seismic actions and rules for buildings~~

~~ii) IS EN 1998-2:2006 Eurocode 8: Design of structures for earthquake resistance - Part 2 Bridges~~

~~iii) IS EN 1998-5:2005 Eurocode 8: Design of structures for earthquake resistance - Part 5 Foundations, retaining structures and geotechnical aspects~~

1.1.10. i) IS EN 1999-1-1:2007 Eurocode 9: Design of aluminium structures– Part 1-1 General structural rules

NA to IS EN 1999-1-1:2007 Irish National Annex to Eurocode 9: Design of aluminium structures - Part 1-1 General structural rules

ii) IS EN 1999-1-3:2007 Eurocode 9: Design of aluminium structures – Part 1-3 Structures susceptible to fatigue

NA to IS EN 1999-1-3:2007 Irish National Annex to Eurocode 9: Design of aluminium structures - Part 1-3 Structures susceptible to fatigue

iii) IS EN 1999-1-4:2007 Irish National Annex to Eurocode 9: Design of aluminium structures – Part 1-4 Cold formed structural sheeting

NA to IS EN 1999-1-4:2007 Irish National Annex to Eurocode 9: Design of aluminium structures - Part 1-4 Cold formed structural sheeting

**1.2 Other Irish/European Standards/Guidance**

1.2.1 IAN 02/11 Interim Requirements for the Use of Eurocodes for the Design of Road Structures (including Geotechnical Works) Amendment No. 1

1.2.2 IS EN 206:2013 Concrete - specification, performance, production and conformity

1.2.3 IS EN 1317-1 Road Restraint Systems - Part 1 Terminology and general criteria for test methods





1.2.4 IS EN 1317-2 Road Restraint Systems - Part 2 Performance classes, impact test acceptance criteria and test methods for safety barriers

1.2.5 IS EN 1337 Structural bearings

1.2.6 IS EN 13369 Common Rules for Precast Concrete products

~~1.2.7 IS EN 1536 Execution of special geotechnical work. Bored piles~~

1.2.8 IS EN 10025 Hot rolled products of structural steels – Part 5: Technical delivery conditions for structural steels with improved atmospheric corrosion resistance

1.2.9 IS EN 15050 Precast concrete products – Bridge elements

1.2.10 IS EN 1090-1 Execution of steel structures and aluminium structures - Part 1: Requirements for conformity assessment of structural components

1.2.11 IS EN 1090-2 Execution of steel structures and aluminium structures – Part 2: Technical requirements for the execution of steel structures

1.2.12 IS EN 1090-3 Execution of steel structures and aluminium structures – Part 3: Technical requirements for aluminium structures

1.2.13 IS EN 13670 Execution of concrete structures

1.2.14 IS EN 15050 Precast concrete products. Bridge elements

1.2.15 CIRIA R155 Bridges - Design for Improved Durability

**1.3 BSI Published Documents**

1.3.1 PD 6688-1-1: Background paper to the UK National Annex to BS EN 1991-1-1

1.3.2 PD 6688-1-2: 2007 Background paper to the UK National Annex to BS EN 1991-1-2

1.3.3 PD 6688-1-4: Background paper to the UK National Annex to BS EN 1991-1-4

1.3.4 PD 6688-1-5: Background paper to the UK National Annex to BS EN 1991-1-5

~~1.3.5 [PD 6688-1-7: Recommendations for the design of structures to BS EN 1991-1-7]~~ not for use in Ireland, TIIBD 60 Use of IS-EN-1991-1-7 is adopted

1.3.6 PD 6688-2: Recommendations for the design of structures to BS EN 1991-2

1.3.7 PD 6687:2006 Background paper to the UK National Annexes to BS EN 1992

1.3.8 PD 6687-1: Background paper to the UK National Annexes to BS EN 1992-1 and BS EN 1992-3

1.3.9 PD 6687-2:2008 Recommendations for the design of structures to BS EN 1992-2:2005

1.3.10 PD 6695-1-9:2008 Recommendations for the design of structures to BS EN 1993-1-9

1.3.11 PD 6695-1-10:2009 Recommendations for the design of structures to BS EN 1993-1-10

1.3.12 PD 6695-2:2008 Recommendation for the design of bridges to BS EN 1993

1.3.13 PD 6696-2:2007 Background paper to BS EN 1994-2 and the UK National Annex to BS EN 1994-2

1.3.14 PD 6694-1 Recommendations for the design of structures subject to traffic loading to BS EN 1997-1:2004

~~1.3.15 PD 6698 Recommendations for the design of structures for earthquake resistance to BS EN 1998~~

1.3.16 PD 6703: Structural bearings – Guidance on the use of structural bearings

**1.4 Other Publications**

CIRIA Document C660 Early-age Thermal Crack Control in Concrete

CIRIA Document C543 Bridge detailing guide





**1.5 TII Design Manual for Roads and Bridges as Implemented by TIIAN 123/10 'Interim Requirements for the Use of Eurocodes for the Design of Road Structures**

| **TII DMRB Standard** | **Status of TII DMRB Standard for use with Eurocodes** | **Additional guidance and/or requirements to be applied for design in conjunction with Eurocodes (see 2.1)** |
|---|---|---|
| **APPROVAL PROCEDURES AND GENERAL DESIGN (TII DMRB 1)** | | |
| **Approval Procedures (TII DMRB 1.1)** | | |
| ~~TIIBD 2 Technical Acceptance of Structures on Motorways and Other National Roads (TII DMRB 1.1.1A)~~ | ~~TIIBD 2 to be applied~~ | ~~None~~ |
| **Other Procedural Documents (TII DMRB 1.2)** | | |
| BD 36 (As implemented by TII Addendum) Evaluation of maintenance costs in comparing alternative designs for highway structures (TII DMRB 1.2.1) | BD 36 (As implemented by TII Addendum) to be applied. | None. |
| *BA 28 Evaluation of maintenance costs in comparing alternative designs for highway structures (TII DMRB 1.2.2)* | BA 28 to be applied. | None. |
| **General Design (TII DMRB 1.3)** | | |
| TIIBD 60 Use of IS EN 1991-1-7 for the Design of Accidental Actions | TIIBD 60 to be applied | None |

| TII DMRB Standard | Status of TII DMRB Standard for use with Eurocodes | Additional guidance and/or requirements to be applied for design in conjunction with Eurocodes (see 2.1) |
|---|---|---|
| BA 59 Design of highway bridges for hydraulic actions (TII DMRB 1.3.6) | Advice Note | Bridges crossing rivers, estuaries and flood plains may be vulnerable to damage or loss due to hydraulic action, and to scour in particular. Designers must consider protection or otherwise minimise these risks by taking account of the effects the bridge and approaches have on the existing hydraulic regime and the various forms of hydraulic action including but not confined to: foundation failure due to scour and bank erosion, hydraulic forces on piers and bridge decks, the effects of debris, ice forces and ship collision.<br>At the concept stage the relevant river and navigation authorities must be consulted to agree the criteria for flow capacity and navigation requirements. The design must take into account effects both upstream and downstream of the structure and future likely changes to the river regime and navigation requirements.<br>Additional guidance is given in 'BA 74 Assessment of scour at bridges (TII DMRB 3.4.21)' and 'HA 45/09 Road drainage and water environment (UK DMRB 11.3.10)' |
| TIIBD 57 Design for durability (DMRB 1.3.7) | TIIBD 57 to be applied | None. |
| *BA 41 The design and appearance of bridges (TII DMRB 1.3.11)* | Advice Note | None |
| ~~BA 42 (As implemented by TII Addendum) The design of integral bridges (incorporating amendment no. 1 dated May 2003) (TII DMRB 1.3.12)~~ | ~~Not to be used. However, the additional guidance and/or requirements in this annex must be taken into consideration.~~ | ~~The recommendations of PD 6694-1 shall now be adopted.~~ |





| TII DMRB Standard | Status of TII DMRB Standard for use with Eurocodes | Additional guidance and/or requirements to be applied for design in conjunction with Eurocodes (see 2.1) |
|---|---|---|
| ~~BD 10 (As implemented by TII Addendum) Design of highway structures in areas of mining subsidence (TII DMRB 1.3.14)~~ | ~~BD 10 (As implemented by TII Addendum) to be applied except references to BS 5400. The additional guidance and/or requirements in this annex must also be taken into consideration.~~ | ~~Sections 3.14, 3.20 and 3.33 make reference to a standard that conflict with Eurocodes (BS 5400). Prior to the publication of a revised version of BD 10 (As implemented by TII Addendum), the relevant Eurocodes should be used in lieu of BS 5400.~~ |
| BA 84 Use of stainless steel reinforcement in highway structures (TII DMRB 1.3.15) | Advice Note | When designing for durability in accordance with TIIBD 57 (TII DMRB 1.3.7), consideration should be given to options for eliminating or reducing the use of corrodible ferrous reinforcement. |
| ~~*BD 90 Design of FRP bridges and highway structures (TII DMRB 1.3.17)*~~ | ~~BD 90 to be applied.~~ | ~~None.~~ |
| **DESIGN (SUBSTRUCTURES AND SPECIAL STRUCTURES) MATERIALS (TII DMRB 2)** | | |
| **Substructures (TII DMRB 2.1)** | | |
| ~~BD 41 (As implemented by TII Addendum) Reinforced clay brickwork retaining walls of pocket type and grouted cavity type construction – use of BS 5628:Part 2:1995 (TII DMRB 2.1.1)~~ | ~~See clause **2.2**.~~ | |
| ~~BD 68 (As implemented by TII Addendum) Crib retaining walls (TII DMRB 2.1.3)~~ | ~~BD 68 (As implemented by TII Addendum) to be applied.~~ | ~~Design must be in accordance with IS EN 1997-1. Materials and Construction Details must be in accordance with TIIMCDRW Volume 1, Series 600, Claus 625.~~ |

| TII DMRB Standard | Status of TII DMRB Standard for use with Eurocodes | Additional guidance and/or requirements to be applied for design in conjunction with Eurocodes (see 2.1) |
|---|---|---|
| ~~BD 70 (As implemented by TII Addendum) Strengthened/reinforced soils and other fills for retaining walls and bridge abutments. (TII DMRB 2.1.5)~~ | ~~Not be used. However, the additional guidance and/or requirements in this annex must be taken into consideration.~~ | ~~Design must be in accordance with BS 8006-1:2010~~ |

| TII DMRB Standard | Status of TII DMRB Standard for use with Eurocodes | Additional guidance and/or requirements to be applied for design in conjunction with Eurocodes (see 2.1) |
|---|---|---|
| **Special Structures (TII/ UK DMRB 2.2)** | | |
| ~~BD 51 (As implemented by TII Addendum) Portal and cantilever signs/signal gantries (TII DMRB 2.2.4)~~ | ~~BD 51 (As implemented by TII Addendum) to be applied except Chapters 3 and 4. The additional guidance and/or requirements in this annex must also be taken into consideration.~~ | ~~Gantries should be designed to withstand static, dynamic, environmental and impact loading; safe for use by maintenance personnel and easily replaceable.~~<br>~~Appropriate risk assessment should be undertaken for protection against vehicle impact. Passive safety consideration should be addressed. Mechanical and electrical engineers should be consulted with regard to electrical safety on impact.~~<br>~~Chapters 3 and 4 of BD 51 on loadings for the design of portal and cantilever sign/signal gantries are based on standards such as BS 5400 and BD 37 that conflict with Eurocodes. Prior to the publication of a revised version of BD 51 (As implemented by TII Addendum), the relevant Eurocodes should be used for the design of portal and cantilever sign/.signal gantries. The combined effect of axial compression, torsion and biaxial bending shall be catered for in the design. See IS EN 1991-1-7 and TIIBD 60 for accidental loading. Deformation criteria and the limiting structural deformations given in Chapter 4 apply.~~ |





| TII DMRB Standard | Status of TII DMRB Standard for use with Eurocodes | Additional guidance and/or requirements to be applied for design in conjunction with Eurocodes (see 2.1) |
|---|---|---|
| ~~*BD 65 Design criteria for collision protection beams (TII DMRB 2.2.5)*~~ | ~~BD 65 to be applied. The additional guidance and/or requirements in this annex must also be taken into consideration.~~ | ~~BD 65 makes references to a number of standards that are in conflict with Eurocodes. Prior to the publication of a revised version of BD 65, the relevant Eurocodes should be used in lieu of the referenced standards.~~<br>~~Annex A - vertical sag requirement should be the same as that given in 'TIITD 27 Cross-sections and headrooms (TII DMRB 6.1.2)'.~~ |
| ~~BD 12 (As implemented by TII Addendum) Design of corrugated steel buried structures with spans greater than 0.9 metres and up to 8.0 metres (TII DMRB 2.2.6)~~ | ~~BD 12 to be applied.~~ | ~~*BD 12 makes reference to a number of standards that are in conflict with Eurocodes. Prior to the publication of a revised version of BD 12 (As implemented by TII Addendum), the relevant Eurocodes should be used in lieu of the relevant standards.*~~ |
| ~~BD 67 (As implemented by TII Addendum) Enclosure of bridges (TII DMRB 2.2.7)~~ | ~~BD 67 (As implemented by TII Addendum) to be applied.~~ | ~~*BD 67 (As implemented by TII Addendum) makes reference to a number of standards that are in conflict with Eurocodes. Prior to the publication of a revised version of BD 67 (As implemented by TII Addendum), the relevant Eurocodes should be used in lieu of the relevant standards.*~~ |
| ~~*BA 67 Enclosure of bridges (TII DMRB 2.2.8)*~~ | ~~Advice Note. The additional guidance and/or requirements in this annex must also be taken into consideration.~~ | ~~See guidance and/or requirements for 'BD 67 (As implemented by TII Addendum) Enclosure of bridges (TII DMRB 2.2.7)'.~~ |

| TII DMRB Standard | Status of TII DMRB Standard for use with Eurocodes | Additional guidance and/or requirements to be applied for design in conjunction with Eurocodes (see 2.1) |
|---|---|---|
| BD 29 (As implemented by TII Addendum) Design criteria for footbridges (TII DMRB 2.2.8) | BD 29 (As implemented by TII Addendum) to be applied. The additional guidance and/or requirements in this annex must also be taken into consideration. | Footbridges should be designed to ease walking and cycling taking account of likely pedestrian and cyclist flows. Account should also be taken of the requirements of mobility-impaired persons including the elderly, people with prams or with walking difficulties and heavily laden shoppers.<br>Footbridges can be prone to various forms of damage, misuse and vandalism by users. Consideration should be given to likely vandalism at the location and whether enclosures are required.<br>Protection measures including security should be provided. Materials vulnerable to fire damage, graffiti and of high scrap value should be avoided at high risk locations<br>The following references are made to standards that conflict with Eurocodes:<br>BD 37 in clauses 4.1, 5.2, 5.4 and 12.7<br>BD 49 in clause 8.3<br>BD 60 in clauses 4.1, 5.2 and 6.2<br>BS 5400 in clause 1.2, 5.1 and 5.3<br>BS 5268 and BS 8118 in clause 5.3<br>Prior to the publication of a revised version of BD 29 (As implemented by TII Addendum), the relevant Eurocodes should be used in lieu of the referenced standards. |
| TIITD 19 Requirement for road restraint systems (TII DMRB 2.2.8A) | TIITD 19 to be applied. | None. |





| TII DMRB Standard | Status of TII DMRB Standard for use with Eurocodes | Additional guidance and/or requirements to be applied for design in conjunction with Eurocodes (see 2.1) |
|---|---|---|
| ~~BD 78 (As implemented by TII Addendum) Design of road tunnels (TII DMRB 2.2.9)~~ | ~~BD 78 (As implemented by TII Addendum) to be applied. The additional guidance and/or requirements in this annex must also be taken into consideration.~~ | ~~The design requirements, including loading, must comply with the Eurocodes.~~<br>~~Road tunnels must be provided with mechanical and electrical systems to enable the tunnels to be safe for use by motorists and by those who need to enter the tunnel, during normal operation, maintenance and emergencies.~~<br>~~The design, supply, installation and testing of individual M&E systems must take due account of the requirements in 'BD 78 (As implemented by TII Addendum) Design of road tunnels (TII DMRB 2.2.9)', 'BD 53 Inspection and records for road tunnels (UK DMRB 3.1.6)' and 'BA 72 Maintenance of road tunnels (UK DMRB 3.2.3)'.~~ |
| BD 82 (As implemented by TII Addendum) Design of buried rigid pipes (TII DMRB 2.2.10) | BD (As implemented by TII Addendum) 82 to be applied. | None. |
| ~~*BD 91 Unreinforced masonry arch bridges (TII DMRB 2.2.14)*~~ | ~~See clause **2.2.**~~ | |

| TII DMRB Standard | Status of TII DMRB Standard for use with Eurocodes | Additional guidance and/or requirements to be applied for design in conjunction with Eurocodes (see 2.1) |
|---|---|---|
| **Materials and Components (TII DMRB 2.3)** | | |
| BD 20 (As implemented by TII Addendum) Bridge bearings. Use of BS 5400: Part 9: 1983 (TII DMRB 2.3.1) | Not to be used. However, the additional guidance and/or requirements in this annex must be taken into consideration. | Design of bearings must be in accordance with IS EN 1337 and PD 6703.<br>Road Structures must be provided, where appropriate, with structural bearings providing the means of transferring loads between the superstructure and substructure while accommodating and/or controlling the articulation. The bearings must, amongst other things, cater for the forces of gravity, traffic, wind and friction to which the bridge is subjected, together with the translational and rotational movements arising, amongst other things, from temperature changes, creep, shrinkage and prestress, and from permanent and traffic loading. |
| TIIBD 52 The Design of Road Bridge Parapets (TII DMRB 2.3.3) | TIIBD 52 to be applied | None. |
| BD 47 (As implemented by TII Addendum) Waterproofing and surfacing of concrete bridge decks (TII DMRB 2.3.4) | BD 47 (As implemented by TII Addendum) to be applied. | None. |
| *BA 47 Waterproofing and surfacing of concrete bridge decks (TII DMRB 2.3.5)* | Advice Note. The additional guidance and/or requirements in this annex must also be taken into consideration. | See guidance and/or requirements for 'BD 47 (As implemented by TII Addendum) Waterproofing and surfacing of concrete bridge decks (TII DMRB 2.3.4)'. |





| TII DMRB Standard | Status of TII DMRB Standard for use with Eurocodes | Additional guidance and/or requirements to be applied for design in conjunction with Eurocodes (see 2.1) |
|---|---|---|
| BD 33 (As implemented by TII Addendum) Expansion joints for use in highway bridge decks (TII DMRB 2.3.6) | BD 33 (As implemented by TII Addendum) to be applied. The additional guidance and/or requirements in this annex must also be taken into consideration. | See also EN 1993-2<br>Expansion joints, which are provided to accommodate movement, must have good riding quality and skid resistance, and must not cause a hazard to any road user, including motorcyclists, cyclists, pedestrians and animals where they have access. Expansion joints must be capable of sustaining traffic loading, including traction and skidding loading, and movements due to traffic, temperature, creep, shrinkage, lateral movement and settlement.<br>Expansion Choice of joint must consider the range of movement to be accommodated, the whole life cost of providing the joint (including traffic delay costs of installation, maintenance and replacement), system environmental issues, sustainability and the noise generated. The same joint must continue across the full width of the deck including footway, verge, hardshoulder and central reserve.<br>BD 33 (As implemented by TII Addendum) makes reference to standards that conflict with Eurocodes. Prior to the publication of a revised BD 33 (As implemented by TII Addendum) the relevant Eurocodes shall be used in lieu of the referenced standard. |
| *BA 26 Expansion joints for use in highway bridge decks (TII DMRB 2.3.7)* | Advice Note. The additional guidance and/or requirements in this annex must also be taken into consideration. | See guidance and/or requirements for 'BD 33 (As implemented by TII Addendum) Expansion joints for use in highway bridge decks (DMRB 2.3.6)'. |
| *BA 36 The use of permanent formwork (TII DMRB 2.3.7)* | Not to be used. However, the additional guidance and/or requirements in this annex must be taken into consideration. | Permanent formwork must be safe for use and capable of resisting all load effects arising during construction, operation or maintenance, without detrimental deflection or risk of uncontrolled displacement. Where provided, temporary seals must be suitable for the proposed use.<br>The adequacy of proposals for permanent formwork should be demonstrated through the use of certified manufacturer's data or though site testing. |

| TII DMRB Standard | Status of TII DMRB Standard for use with Eurocodes | Additional guidance and/or requirements to be applied for design in conjunction with Eurocodes (see 2.1) |
|---|---|---|
| ~~*BA 82 Formation of continuity joints in bridge decks (TII DMRB 2.3.7)*~~ | ~~Advice Note.~~ | |
| ~~*BD 7 (As implemented by TII Addendum) Weathering steel for highway structures (TII DMRB 2.3.8)*~~ | ~~*BD 7 (As implemented by TII Addendum) to be applied. The additional guidance and/or requirements in this annex must also be taken into consideration.*~~ | ~~*The requirements of BD 7 (As implemented by TII Addendum) are to be adopted for the design of weathering steel structures, subject to the following amendments.*~~<br>~~*In BD 7 (As implemented by TII Addendum), where reference is made to IS EN 10155, this standard has been superseded by IS EN 10025-5, which should be adopted.*~~<br>~~*In BD 7 Clause 4.2, delete ', in accordance with clause 7.2 of BS 5400: Part 3,'*~~<br>~~*In BD 7 Clause 4.3, delete ', in accordance with BS 5400: Part 3,'*~~ |
| ~~*BA 92 Use of recycled concrete aggregates in structural concrete (TII DMRB 2.3.9)*~~ | ~~Advice Note.~~ | |
| **Paints and other Protective Coatings (TII DMRB 2.4)** | | |
| BD 35 (As implemented by TII Addendum) Quality assurance scheme for paints and similar protective coatings (TII DMRB 2.4.1) | BD 35 (As implemented by TII Addendum) to be fully applied. The additional guidance and/or requirements in this annex must also be taken into consideration. | Steelwork in road structures must be protected against corrosion by a protection system. |





| TII DMRB Standard | Status of TII DMRB Standard for use with Eurocodes | Additional guidance and/or requirements to be applied for design in conjunction with Eurocodes (see 2.1) |
|---|---|---|
| BD 43 (As implemented by TII Addendum) The impregnation of reinforced and prestressed concrete highway structures using hydrophobic pore-lining impregnants TII(DMRB 2.4) | BD 43 (As implemented by TII Addendum) to be applied. | None. |
| *BA 85 Coatings for concrete highway structures & ancillary structures (DMRB 2.4.3)* | Advice Note. | None. |
| **INSPECTION AND MAINTENANCE (TII DMRB 3)** | | |
| **Inspection (TII DMRB 3.1)** | | |
| *BD 45 Identification markings of highway structures (TII DMRB 3.1.1)* | BD 45 for reference. | Identification of road structure shall be in accordance with the requirements of the Bridge Management Section of the NRA. |
| **Maintenance (UK DMRB 3.2)** | | |
| ~~BD 62 As built, operational and maintenance records for highway structures (UK DMRB 3.2.1)~~ | ~~BD 62 to be applied. The additional guidance and/or requirements in this annex must also be taken into consideration.~~ | ~~Where appropriate see also 'BD 53 Inspection and records for road tunnels (UK DMRB 3.1.6)' and 'BD 63 Inspection of highway structures (UK DMRB 3.1.4)'.~~<br>~~See also TIIBD 02 and Contract specific requirements.~~ |
| **ROAD GEOMETRY (TII DMRB 6)** | | |
| **Links (TII DMRB 6.1)** | | |

| TII DMRB Standard | Status of TII DMRB Standard for use with Eurocodes | Additional guidance and/or requirements to be applied for design in conjunction with Eurocodes (see 2.1) |
|---|---|---|
| ~~TIITD 27 Cross-sections and headrooms (TII DMRB 6.1.2)~~ | ~~TIITD 27 to be applied.~~ | ~~High Load Routes: If particular routes are nominated as High Load Routes by the National Roads Authority. If the structures are identified to be along these routes, headroom must be provided as required for the route*.~~ |
| **ENVIRONMENTAL DESIGN AND MANAGEMENT (UK DMRB 10)** | | |
| **Environmental Barriers (UK DMRB 10.5)** | | |
| ~~HA 66 environmental barriers (UK DMRB 10.5.2)~~ | ~~HA 66 to be fully applied except Chapters 6 and 7 and Appendices A, B and C. The additional guidance and/or requirements in this annex must also be taken into consideration.~~ | ~~Environmental barriers, providing visual screening and noise reduction, should be designed to resist all load effects arising during operation, or maintenance, without rupture or instability, detrimental deflection or vibration. Consideration should be given to the environmental impact of the barrier itself.~~<br>~~Chapters 6 and 7 and Appendices A, B and C of HA 66 contain design rules based on standards such as BS 5400 and BD 37 that conflict with Eurocodes. Prior to the publication of a revised version of HA 66, the relevant Eurocodes should be used for the design of environmental barriers.~~ |

* Subject to the agreement of Wexford County Council





**TII DMRB Standards & Advice Notes not to be used with Eurocodes**

| **APPROVAL PROCEDURES AND GENERAL DESIGN (TII DMRB 1)** |
|---|
| **General Design (TII DMRB 1.3)** |
| TIIBD 24 The design of concrete highway bridges and structures. Use of BS 5400: Part 4: 1990 (TII DMRB 1.3.1) |
| BD 15 (As implemented by TII Addendum) General principles for the design and construction of bridges: use of BS 5400: Part 1: 1988 (TII DMRB 1.3.2) |
| BD 49 (As implemented by TII Addendum) Design rules for aerodynamic effects on bridges (TII DMRB 1.3.3)[NoteC1] |
| *BA 40 Tack welding of reinforcing bars (TII DMRB 1.3.4)* |
| ~~BD 58 (As implemented by TII Addendum) Design of bridges and concrete structures with external and unbonded prestressing (TII DMRB 1.3.9)~~ |
| ~~*BA 58 Design of bridges and concrete structures with external and unbonded prestressing (TII DMRB 1.3.10)*~~ |
| *BA 53 Bracing systems and the use of U-frames in steel highway bridges (TII DMRB 1.3.13)* |
| BD 9 (As implemented by TII Addendum) The use of BS 5400 Part 10: 1980 – code of practice for fatigue (TII DMRB 1.3.14) |
| BD 13 (As implemented by TII Addendum) Design of steel bridges. Use of BS 5400-3:2000 (TII DMRB 1.3) |
| ~~BD 16 (As implemented by TII Addendum) Design of composite bridges. Use of BS 5400: Part 5: 1979 (TII DMRB 1.3)~~ |
| BD 28 (As implemented by TII Addendum) Early thermal cracking of concrete (TII DMRB 1.3.) |
| BD 37 (As implemented by TII Addendum) Loads for highway bridges (TII DMRB 1.3.14) |
| *BA 9 The use of BS 5400 Part 10: 1980 – code of practice for fatigue (TII DMRB 1.3)* |
| *BA 19 Use of BS 5400-3:1982 (TII DMRB 1.3)* |
| *BA 24 Early thermal cracking of concrete (TII DMRB 1.3)* |
| ~~BD 84 (As implemented by TII Addendum) Strengthening of concrete bridge supports for vehicle impact using fibre reinforced polymers (TII DMRB 1.3.16)~~ |
| ~~*BD 85 Strengthening highway structures using externally bonded fibre reinforced polymers (TII DMRB 1.3.18)*~~ |
| **DESIGN (SUBSTRUCTURES AND SPECIAL STRUCTURES) MATERIALS (TII DMRB 2)** |
| **Substructures (TII DMRB 2.1)** |
| BD 42 (As implemented by TII Addendum) Design of embedded retaining walls and bridge abutments (TII DMRB 2.1.2) |
| BD 30 (As implemented by TII Addendum) Backfilled retaining walls and bridge abutments (TII DMRB 2.1) |
| *BA 80 Use of rock bolts (TII DMRB 2.1.7)* |
| BD 74 (As implemented by TII Addendum) Foundations (TII DMRB 2.1.8) |
| **Special Structures (TII DMRB 2.2)** |
| BD 31 (As implemented by TII Addendum) The design of buried concrete box and portal frame structures (TII DMRB 2.2.12) |
| **Materials and Components (TII DMRB 2.3)** |

| | |
|---|---|
| *BA 37 Priority Ranking of Existing Parapets (TII DMRB 2.3.2)* | |
| **INSPECTION AND MAINTENANCE (TII DMRB 3)** | **This volume is not to be used with Eurocodes unless otherwise noted in Annex C1 or agreed with the Bridge Management Section of the NRA.** |
| **Inspection (TII DMRB 3.1)** | |
| **Maintenance (TII DMRB 3.2)** | |
| **Repair (TII DMRB 3.3)** | |
| **Assessment (TII DMRB 3.4)** | |

**1.6 Related TIIPublications with amendments**

| Title |
|---|
| Manual of Contract Documents for Road Works |
| Volume 1, Specification for Road Works |
| Volume 2, Notes for Guidance on the Specification for Road Works |
| Volume 3, Section 1: Method of Measurement for Road Works |
| Volume 3, Section 2: Notes for Guidance on the Method of Measurement for Road Works |
| Volume 4, Road Construction Details |
| National Roads Projects Management Guidelines |
| Guidelines for Traffic Calming for Towns and Villages on National Routes, Revision B |
| TIIRoad Safety Audit Guidelines |

The above referenced documents are subject to review and revision on a regular basis and this Technical Acceptance Report is based on the version as at the date of this document. The documents will be reviewed at commencement of detailed design.

**1.7 Other Design Standards**

| Title |
|---|
| BS6349 – Maritime Works |
| Part 1 Maritime structures. General criteria |
| Part 1-1 Maritime works. General. Code of practice for planning and design for operations |
| Part 1-2 Maritime works. General. Code of practice for assessment of actions |
| Part 1-3 Maritime works. General. Code of practice for geotechnical design |
| Part 1-4 Maritime works. General. Code of practice for materials |
| Part 2 Maritime structures. Design of quay walls, jetties and dolphins |
| ~~Part 3 Maritime structures. Design of dry docks, locks, slipways and shipbuilding berths, shiplifts and dock and lock gates~~ |
| Part 4 Maritime structures. Design of fendering and mooring systems |
| Part 5 Maritime structures. Code of practice for dredging and land reclamation |
| Part 6 Maritime structures. Design of inshore moorings and floating structures |
| Part 7 Maritime structures. Guide to the design and construction of breakwaters |
| Part 8 Maritime structures. Code of practice for the design of Ro-Ro ramps, linkspans and walkways |





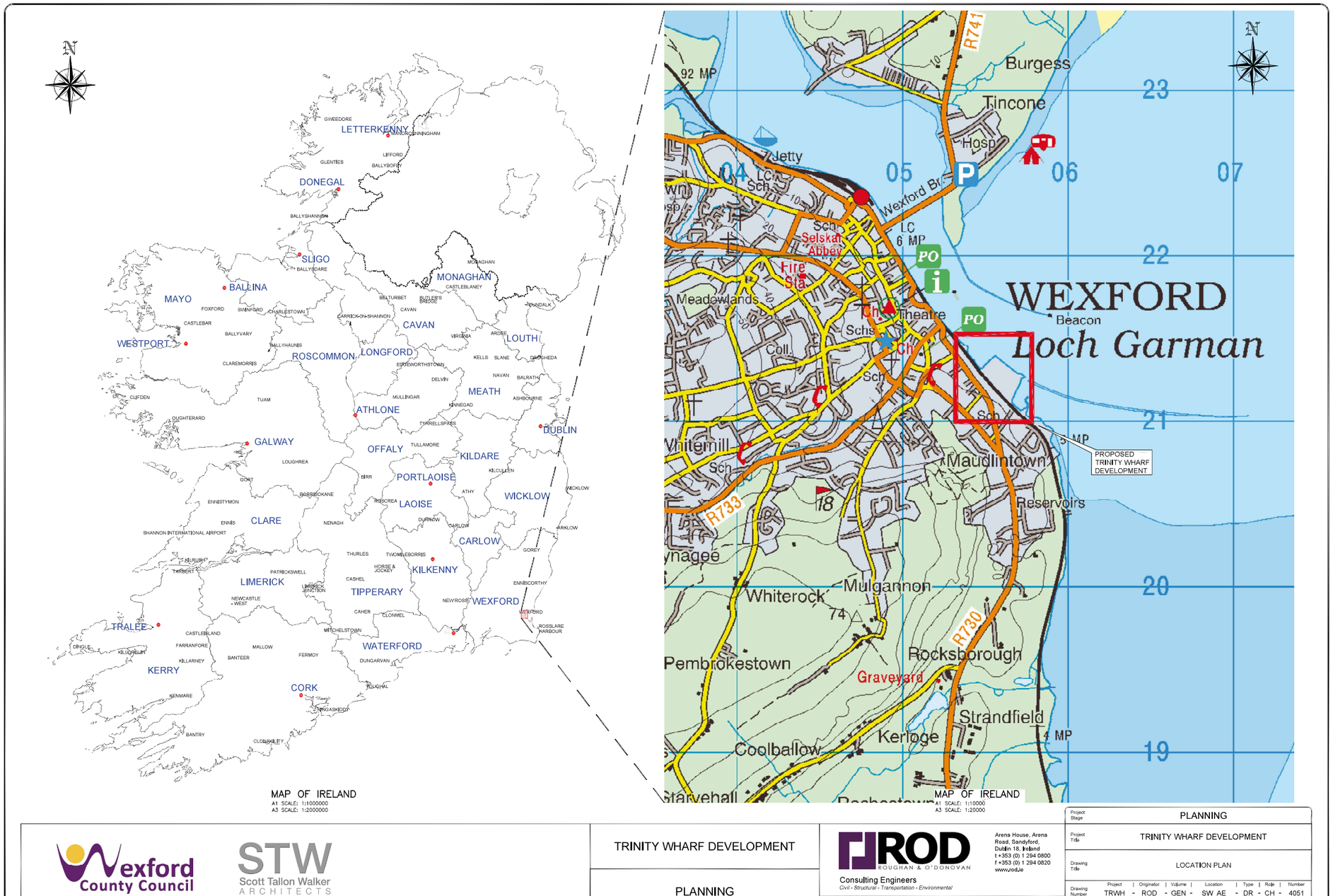
| |
|---|
| The Design Manual for Urban Roads and Streets |
| CIRIA Guide, The Use of Rock in Hydraulic Engineering |
| Eurotop, Manual on Wave Overtopping and of sea defences and related structures |

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**ROUGHAN** & **O'DONOVAN CONSULTING ENGINEERS**

Arena House
Arena Road
Sandyford
Dublin 18
D18 V8P6
Ireland

**Phone** +353 1 294 0800
**Email** info@rod.ie




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ROD ROUGHAN & O'DONOVAN
Consulting Engineers
*Civil - Structural - Transportation - Environmental*

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t +353 (0) 1 294 0800
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| Project Title | TRINITY WHARF DEVELOPMENT |
| Drawing Title | LOCATION PLAN |

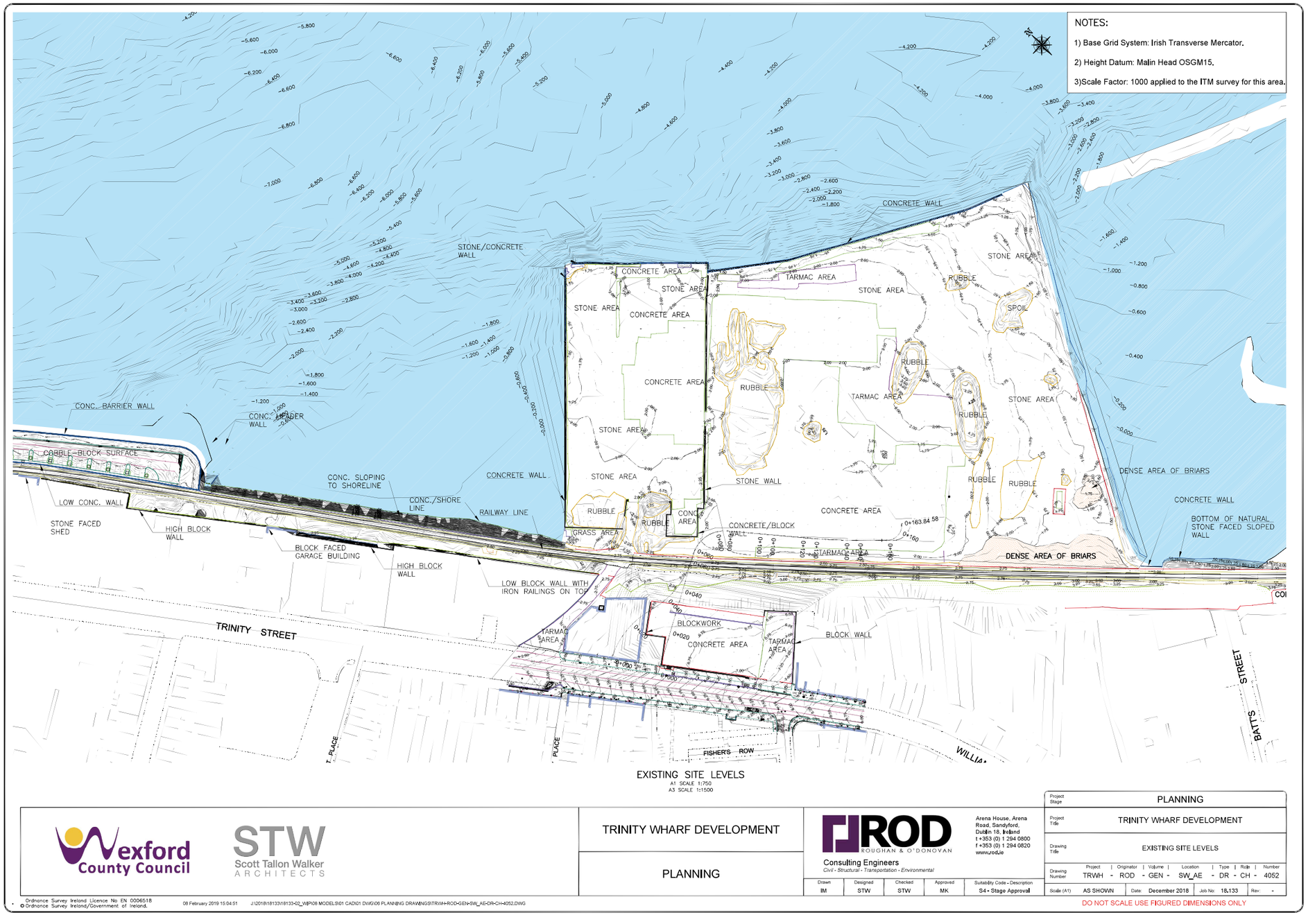
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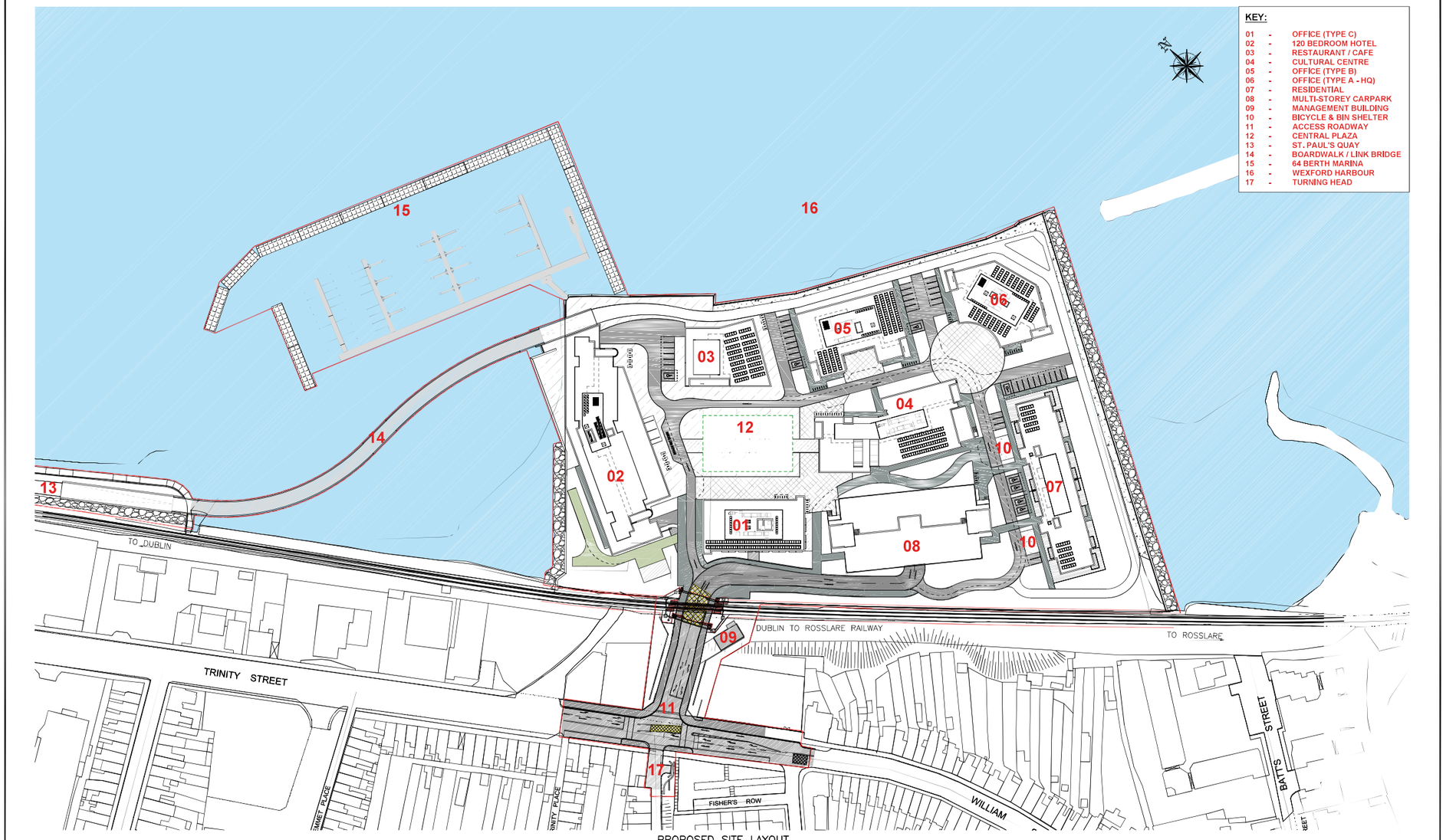
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NOTES:
1) Base Grid System: Irish Transverse Mercator.
2) Height Datum: Malin Head OSGM15.
3)Scale Factor: 1000 applied to the ITM survey for this area.
CONCRETE WALL
STONE/CONCRETE WALL
CONCRETE AREA
STONE AREA
TARMAC AREA
RUBBLE
SPOIL
CONC. BARRIER WALL
CONC. HEADER WALL
COBBLE-BLOCK SURFACE
CONC. SLOPING TO SHORELINE
CONC./SHORE LINE
RAILWAY LINE
LOW CONC. WALL
STONE FACED SHED
HIGH BLOCK WALL
BLOCK FACED GARAGE BUILDING
GRASS AREA
CONCRETE/BLOCK WALL
LOW BLOCK WALL WITH IRON RAILINGS ON TOP
BLOCKWORK
BLOCK WALL
DENSE AREA OF BRIARS
BOTTOM OF NATURAL STONE FACED SLOPED WALL
TRINITY STREET
FISHER'S ROW
BATT'S STREET
EXISTING SITE LEVELS
A1 SCALE 1:750
A3 SCALE 1:1500
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Consulting Engineers
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Project Title: TRINITY WHARF DEVELOPMENT
Drawing Title: EXISTING SITE LEVELS
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Scale (A1): AS SHOWN | Date: December 2018 | Job No: 18133 | Rev: -
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PROPOSED SITE LAYOUT
A1 SCALE 1:800
A3 SCALE 1:1600

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|---|---|
| Project Stage | PLANNING |
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| Drawing Title | PROPOSED SITE LAYOUT |
| Drawing Number | Project \| Originator \| Volume \| Location \| Type \| Role \| Number: TRWH - ROD - GEN - SW_AE - DR - CH - 4053 |
| Scale (A1) | AS SHOWN |
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| Job No | 18.133 |
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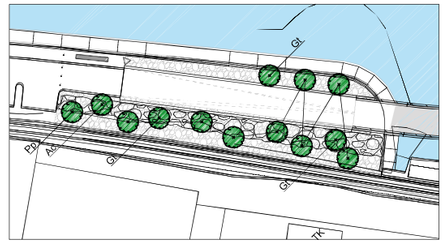
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PLANTING PLAN - KEY

- Proposed Tree Planting (refer to planting schedule and detail 901)
- Proposed Street Trees (refer to planting schedule and detail 901)
- Proposed Shrubs Coastal Mix (refer to planting schedule and detail 902)
- Proposed Shrubs Defensive Mix (refer to planting schedule and detail 902)
- Proposed Shrubs Ground Cover (refer to planting schedule and detail 902)
- Proposed Wildflower Grassland (refer to planting schedule for mix)
- Proposed Shrubs Railway Edge (refer to planting schedule and detail 902)
- Proposed Reinforced Amenity Grass
- Proposed Formal Hedge (refer to planting schedule and detail 903)
- Proposed Native Hedge (refer to planting schedule and detail 903)
- Proposed Play Area (refer to SK13)
- Proposed Buildings (For sedum roof locations refer to architects drawings)



LANDSCAPE AND PUBLIC REALM FACILITIES
A1 SCALE 1:500
A3 SCALE 1:1000

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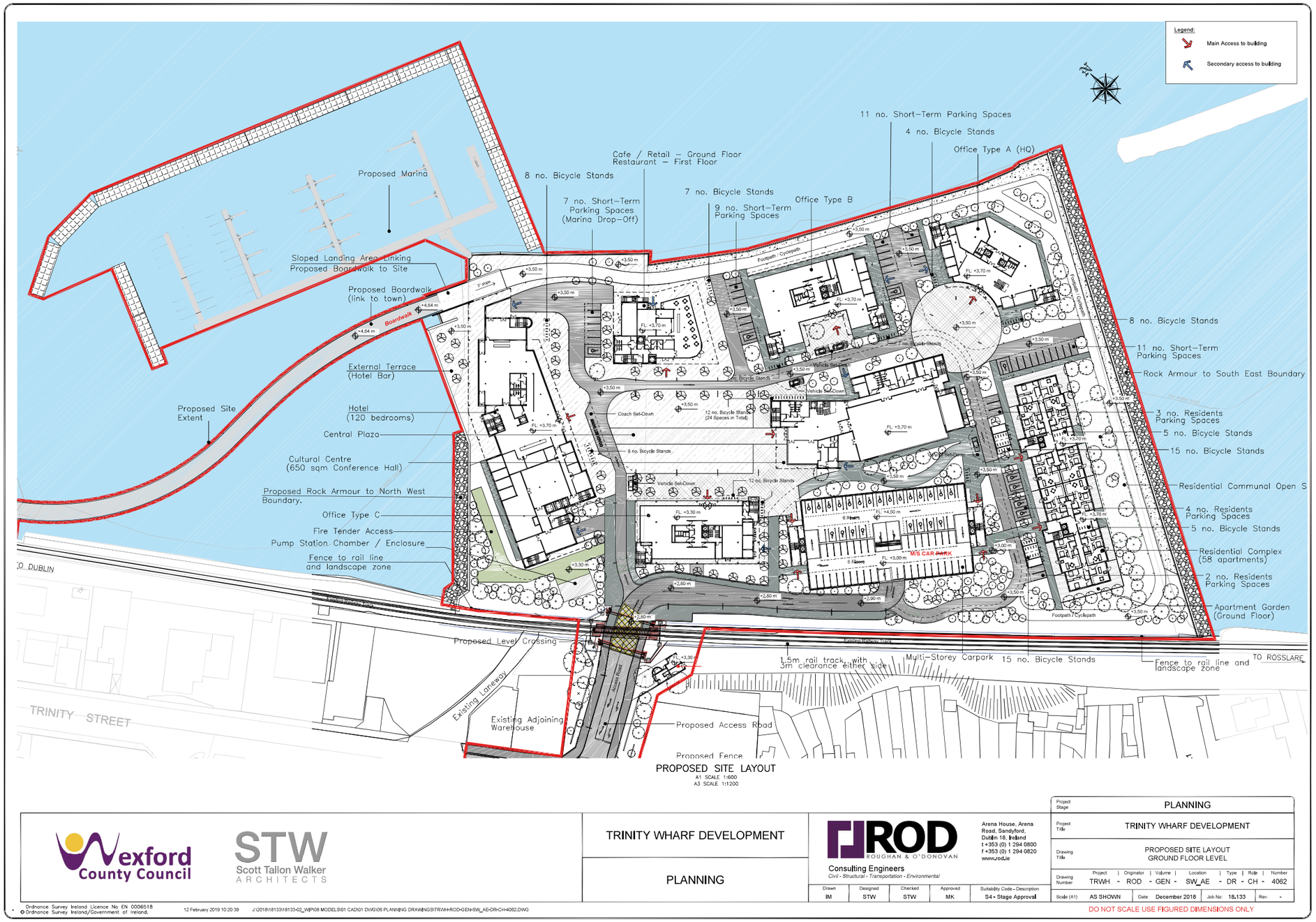
NOTE: This drawing shall be read in conjunction with the Landscape Architecture Drawings

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| Drawing Title | LANDSCAPING AND PUBLIC REALM FACILITIES |
| Drawing Number | Project \| Originator \| Volume \| Location \| Type \| Role \| Number: TRWH - ROD - GEN - SW_AE - DR - CH - 4061 |
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PROPOSED SITE LAYOUT
A1 SCALE 1:600
A3 SCALE 1:1200

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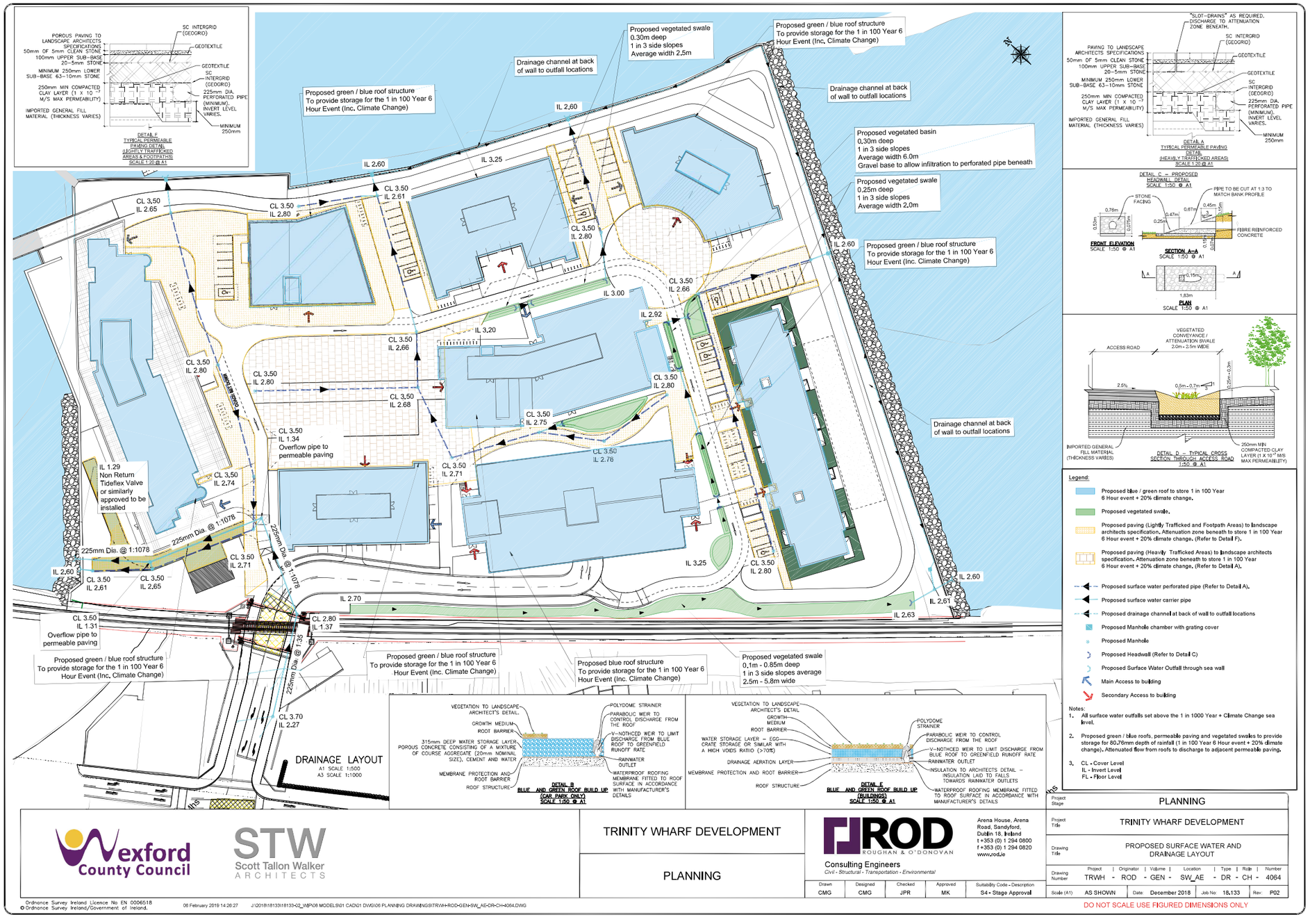
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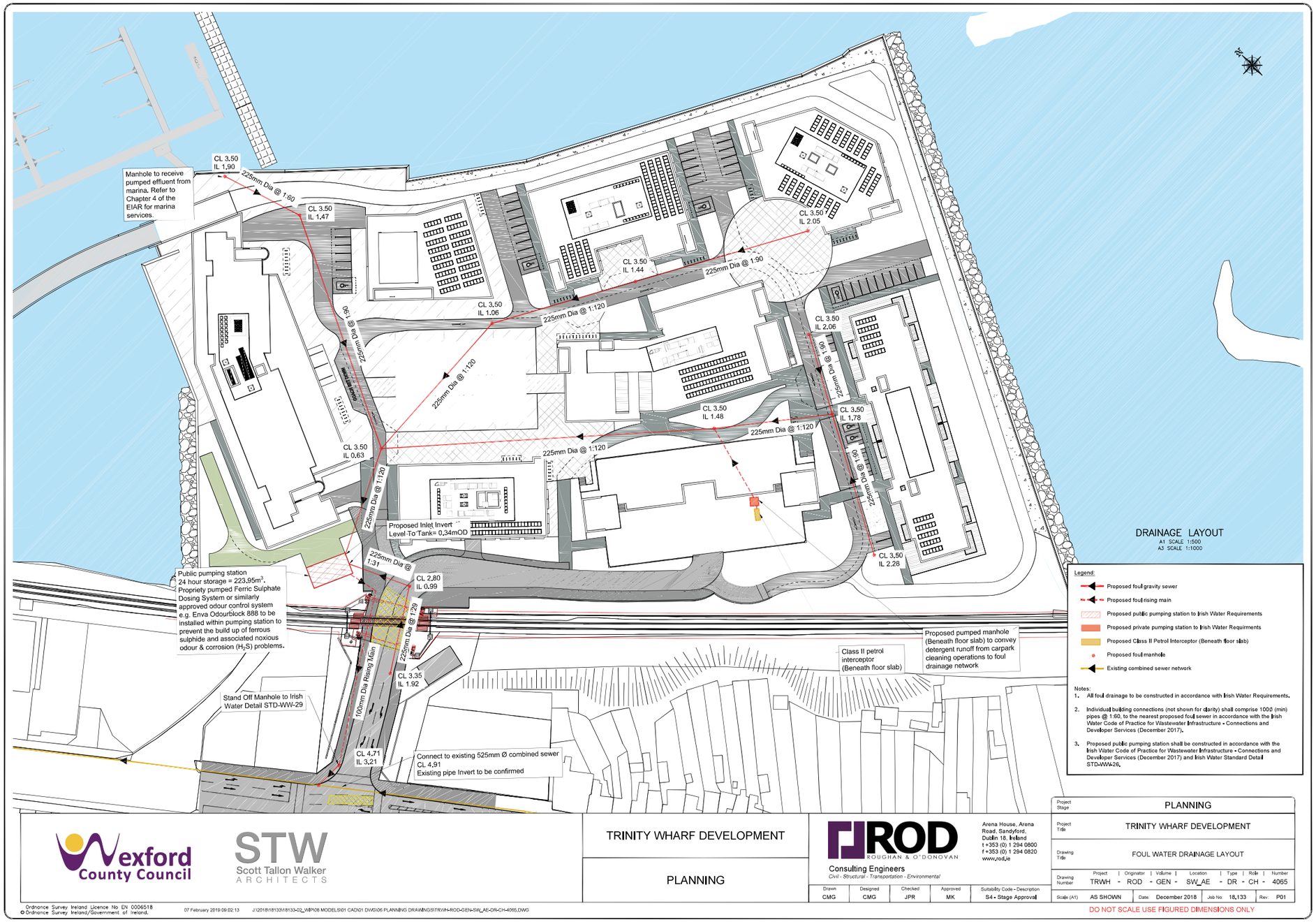
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| Drawing Number | Project \| Originator \| Volume \| Location \| Type \| Role \| Number: TRWH - ROD - GEN - SW_AE - DR - CH - 4062 |
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DETAIL F
TYPICAL PERMEABLE PAVING DETAIL (LIGHTLY TRAFFICKED AREAS & FOOTPATHS)
SCALE 1:20 @ A1
Proposed green / blue roof structure To provide storage for the 1 in 100 Year 6 Hour Event (Inc. Climate Change)
Drainage channel at back of wall to outfall locations
Proposed vegetated swale 0.30m deep 1 in 3 side slopes Average width 2.5m
Proposed green / blue roof structure To provide storage for the 1 in 100 Year 6 Hour Event (Inc. Climate Change)
Drainage channel at back of wall to outfall locations
Proposed vegetated basin 0.30m deep 1 in 3 side slopes Average width 6.0m Gravel base to allow infiltration to perforated pipe beneath
Proposed vegetated swale 0.25m deep 1 in 3 side slopes Average width 2.0m
Proposed green / blue roof structure To provide storage for the 1 in 100 Year 6 Hour Event (Inc. Climate Change)
IL 1.29 Non Return Tideflex Valve or similarly approved to be installed
Overflow pipe to permeable paving
Overflow pipe to permeable paving
Proposed green / blue roof structure To provide storage for the 1 in 100 Year 6 Hour Event (Inc. Climate Change)
Proposed green / blue roof structure To provide storage for the 1 in 100 Year 6 Hour Event (Inc. Climate Change)
Proposed blue roof structure To provide storage for the 1 in 100 Year 6 Hour Event (Inc. Climate Change)
Proposed vegetated swale 0.1m - 0.85m deep 1 in 3 side slopes average 2.5m - 5.8m wide
DRAINAGE LAYOUT
A1 SCALE 1:500
A3 SCALE 1:1000
DETAIL B
BLUE AND GREEN ROOF BUILD UP (CAR PARK ONLY)
SCALE 1:50 @ A1
DETAIL E
BLUE AND GREEN ROOF BUILD UP (BUILDINGS)
SCALE 1:50 @ A1
DETAIL A
TYPICAL PERMEABLE PAVING DETAIL (HEAVILY TRAFFICKED AREAS)
SCALE 1:20 @ A1
DETAIL C – PROPOSED HEADWALL DETAIL
SCALE 1:50 @ A1
DETAIL D – TYPICAL CROSS SECTION THROUGH ACCESS ROAD
1:50 @ A1
Legend:
Proposed blue / green roof to store 1 in 100 Year 6 Hour event + 20% climate change.
Proposed vegetated swale.
Proposed paving (Lightly Trafficked and Footpath Areas) to landscape architects specification. Attenuation zone beneath to store 1 in 100 Year 6 Hour event + 20% climate change. (Refer to Detail F).
Proposed paving (Heavily Trafficked Areas) to landscape architects specification. Attenuation zone beneath to store 1 in 100 Year 6 Hour event + 20% climate change. (Refer to Detail A).
Proposed surface water perforated pipe (Refer to Detail A).
Proposed surface water carrier pipe
Proposed drainage channel at back of wall to outfall locations
Proposed Manhole chamber with grating cover
Proposed Manhole
Proposed Headwall (Refer to Detail C)
Proposed Surface Water Outfall through sea wall
Main Access to building
Secondary Access to building
Notes:
1. All surface water outfalls set above the 1 in 1000 Year + Climate Change sea level.
2. Proposed green / blue roofs, permeable paving and vegetated swales to provide storage for 80.76mm depth of rainfall (1 in 100 Year 6 Hour event + 20% climate change). Attenuated flow from roofs to discharge to adjacent permeable paving.
3. CL - Cover Level IL - Invert Level FL - Fjoor Level
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Project Stage PLANNING
Project Title TRINITY WHARF DEVELOPMENT
Drawing Title PROPOSED SURFACE WATER AND DRAINAGE LAYOUT
Drawing Number TRWH - ROD - GEN - SW_AE - DR - CH - 4064
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Manhole to receive pumped effluent from marina. Refer to Chapter 4 of the EIAR for marina services.
CL 3.50
IL 1.90
225mm Dia @ 1:60
CL 3.50
IL 1.47
225mm Dia @ 1:90
CL 3.50
IL 0.63
225mm Dia @ 1:120
CL 3.50
IL 1.06
225mm Dia @ 1:120
CL 3.50
IL 1.44
225mm Dia @ 1:90
CL 3.50
IL 2.05
CL 3.50
IL 2.06
225mm Dia @ 1:90
CL 3.50
IL 1.48
225mm Dia @ 1:120
CL 3.50
IL 1.78
225mm Dia @ 1:90
CL 3.50
IL 2.26
Proposed Inlet Invert Level To Tank= 0,34mOD
225mm Dia @ 1:31
Public pumping station 24 hour storage = 223,95m³. Propriety pumped Ferric Sulphate Dosing System or similarly approved odour control system e.g. Enva Odourblock 888 to be installed within pumping station to prevent the build up of ferrous sulphide and associated noxious odour & corrosion ($H_2S$) problems.
CL 2,80
IL 0,99
225mm Dia @ 1:29
CL 3.35
IL 1.92
100mm Dia Rising Main
Stand Off Manhole to Irish Water Detail STD-WW-29
CL 4.71
IL 3,21
Connect to existing 525mm Ø combined sewer
CL 4,91
Existing pipe Invert to be confirmed
Class II petrol interceptor (Beneath floor slab)
Proposed pumped manhole (Beneath floor slab) to convey detergent runoff from carpark cleaning operations to foul drainage network
DRAINAGE LAYOUT
A1 SCALE 1:500
A3 SCALE 1:1000
Legend:
Proposed foul gravity sewer
Proposed foul rising main
Proposed public pumping station to Irish Water Requirements
Proposed private pumping station to Irish Water Requirments
Proposed Class II Petrol Interceptor (Beneath floor slab)
Proposed foul manhole
Existing combined sewer network
Notes:
1. All foul drainage to be constructed in accordance with Irish Water Requirements.
2. Individual building connections (not shown for clarity) shall comprise 100ø (min) pipes @ 1:60, to the nearest proposed foul sewer in accordance with the Irish Water Code of Practice for Wastewater Infrastructure - Connections and Developer Services (December 2017).
3. Proposed public pumping station shall be constructed in accordance with the Irish Water Code of Practice for Wastewater Infrastructure - Connections and Developer Services (December 2017) and Irish Water Standard Detail STD-WW-26.
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Project Stage: PLANNING
Project Title: TRINITY WHARF DEVELOPMENT
Drawing Title: FOUL WATER DRAINAGE LAYOUT
Drawing Number: Project TRWH - Originator ROD - Volume GEN - Location SW_AE - Type DR - Role CH - Number 4065
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Legend:

- Proposed 150mm dia. watermain to Irish Water Requirements.
- Proposed 25mm dia. watermain service connection to Irish Water Requirements.
- Existing watermain
- M — Proposed bulk water meter
- SV — Proposed sluice valve
- SCV — Proposed scour valve
- H — Proposed hydrant
- Proposed Draw Point for fire-fighting purposes.
- Proposed pipe for supply of sea water for fire-fighting purposes.

Notes:

1. All watermains to be constructed in accordance with Irish Water Requirements.
2. Boundary boxes to be situated a minimum of 225mm from boundary of properties.
3. Stop-Cocks with provision for water meters shall be provided in accordance with Irish Water Code of Practice.
4. Boundary boxes to be constructed in accordance with Irish Water Detail STD-W-03.
5. Hydrants to be constructed in accordance with Irish Water Detail STD-W-18.
6. Sluice Valves to be constructed in accordance with Irish Water Detail STD-W-15.
7. Pipe bedding and backfill to be constructed in accordance with Irish Water Detail STD-W-13.
8. Marker posts to be constructed in accordance with Irish Water Detail STD-W-27.
9. Thrust blocks to be constructed in accordance with Irish Water Detail STD-W-28.
10. Scour valves to be constructed in accordance with Irish Water Details STD-W-30 & STD-W-30A.

WATERMAIN LAYOUT
A1 SCALE 1:500
A3 SCALE 1:1000

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| Project Stage | PLANNING |
| Project Title | TRINITY WHARF DEVELOPMENT |
| Drawing Title | WATERMAIN LAYOUT |

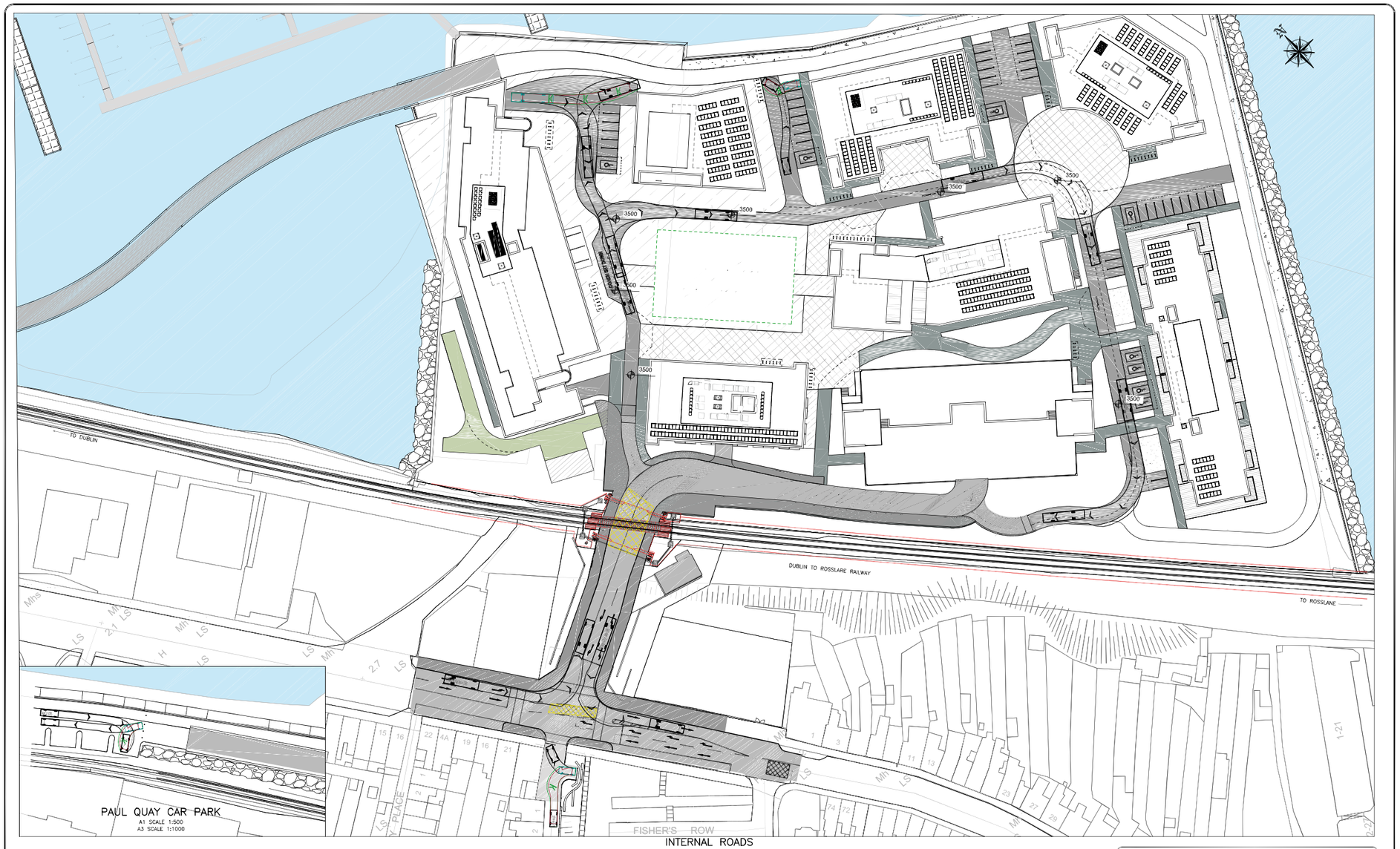
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| Scale (A1) | Date | Job No | Rev |
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| AS SHOWN | December 2018 | 18.133 | - |

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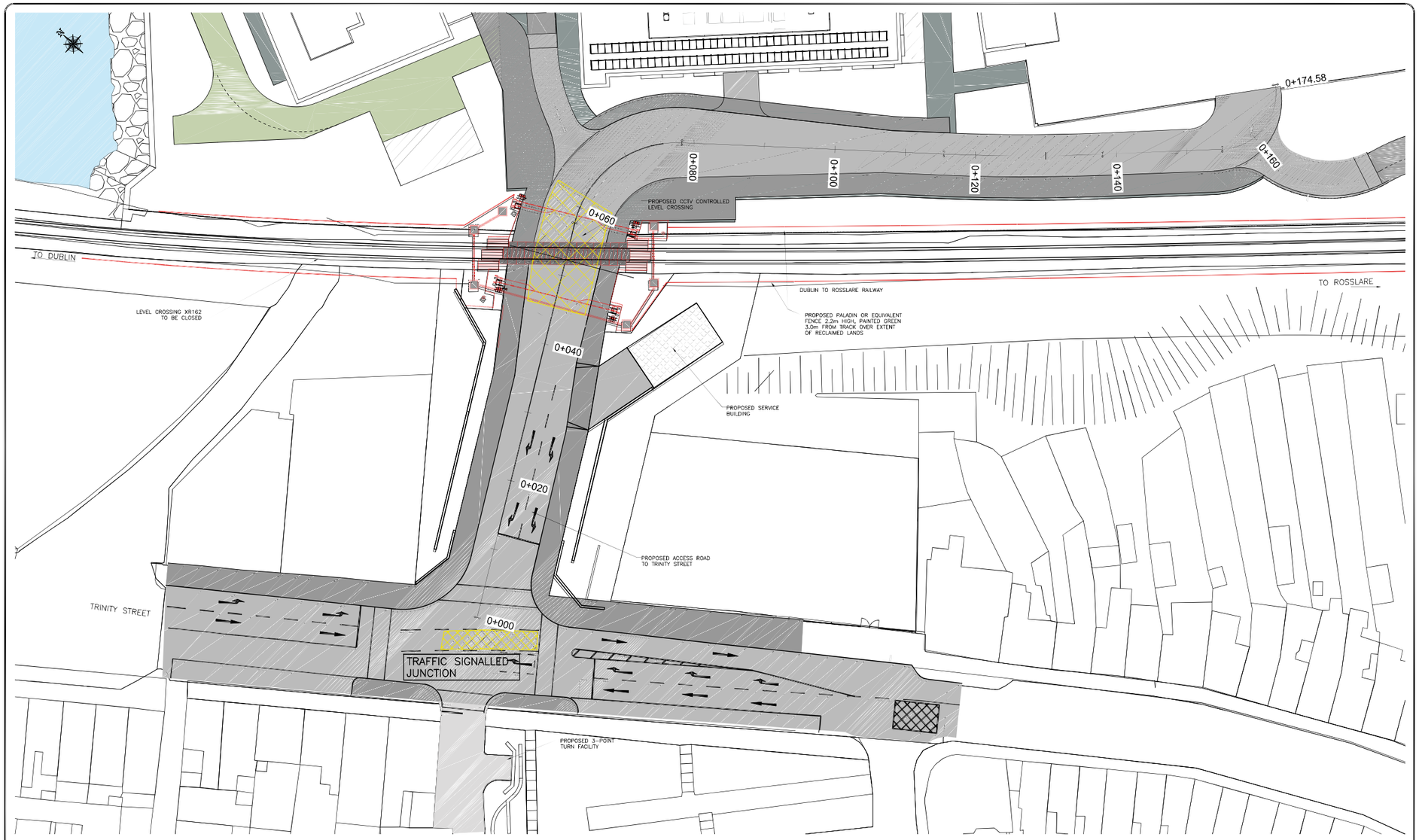
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| JA | JA | MK | MK | S4 - Stage Approval |

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| Project Stage | PLANNING |
| Project Title | TRINITY WHARF DEVELOPMENT |
| Drawing Title | INTERNAL ROADS AUTOTRACK |
| Drawing Number | Project \| Originator \| Volume \| Location \| Type \| Role \| Number: TRWH - ROD - GEN - SW_AE - DR - CH - 4071 |
| Scale (A1) | AS SHOWN |
| Date | December 2018 |
| Job No | 18.133 |
| Rev | - |

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CROSSING LAYOUT
A1 SCALE 1:250
A3 SCALE 1:500

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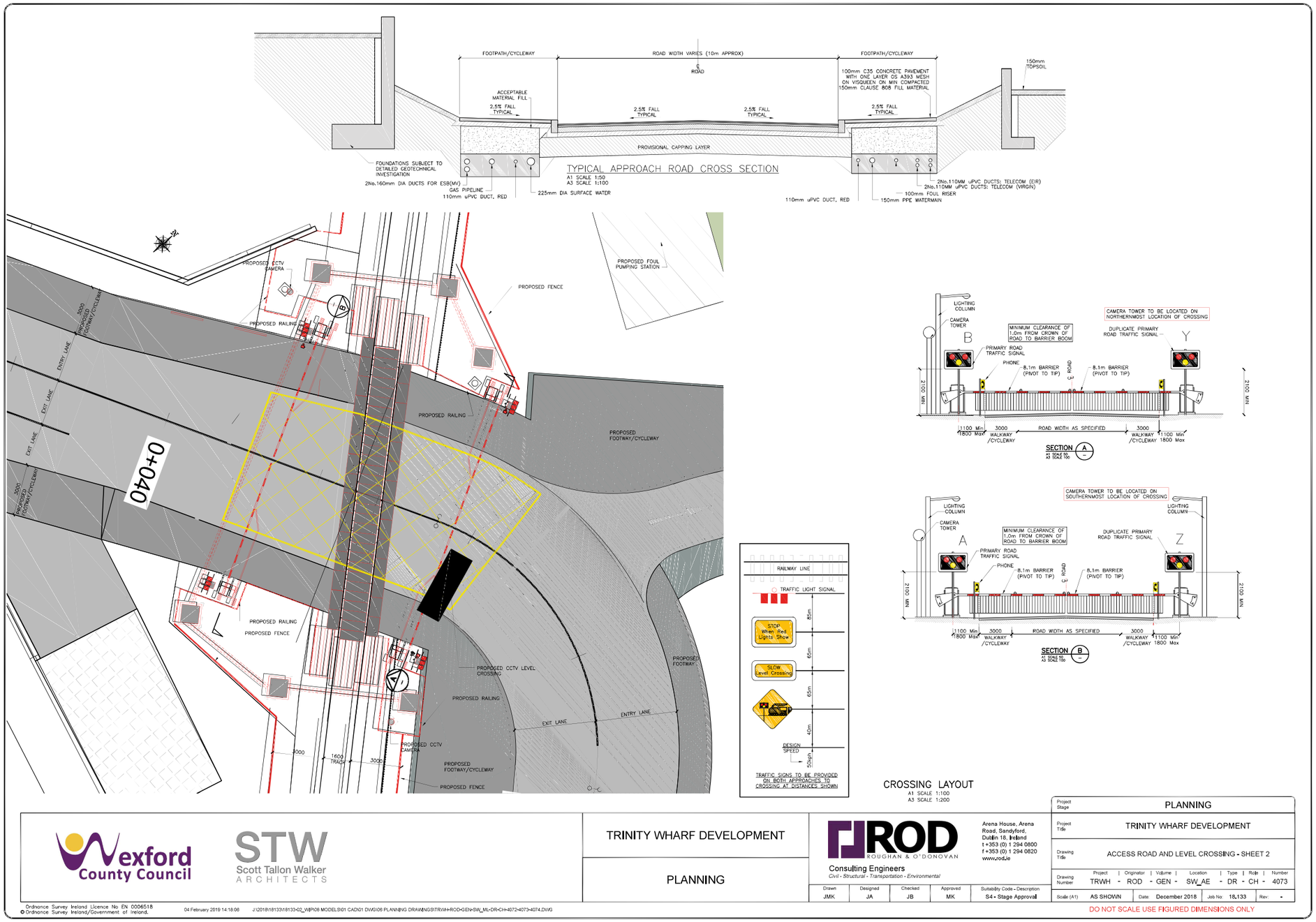
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| Project Stage | PLANNING |
| Project Title | TRINITY WHARF DEVELOPMENT |
| Drawing Title | ACCESS ROAD AND LEVEL CROSSING - SHEET 1 |
| Drawing Number | Project \| Originator \| Volume \| Location \| Type \| Role \| Number: TRWH - ROD - GEN - SW_AE - DR - CH - 4072 |
| Scale (A1) | AS SHOWN |
| Date: | December 2018 |
| Job No: | 18.133 |
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| JMK | JA | JB | MK | S4 - Stage Approval |

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| Project Title | TRINITY WHARF DEVELOPMENT |
| Drawing Title | ACCESS ROAD AND LEVEL CROSSING - SHEET 2 |

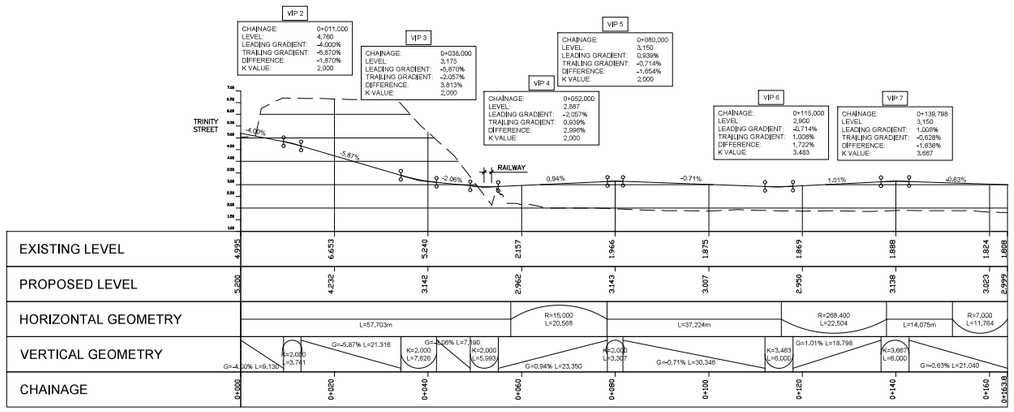
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| Scale (A1) | Date | Job No | Rev. |
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PROPOSED LONGITUDINAL SECTION – ACCESS ROAD

A1 SCALE 1:500, HORIZ 1:100 VERT
A3 SCALE 1:1000, HORIZ 1:200 VERT

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P02 MINOR AMENDMENTS 04/01/19 DS GM MK

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| JMK | JA | JB | MK | S4 - Stage Approval |

Project Stage: PLANNING

Project Title: TRINITY WHARF DEVELOPMENT

Drawing Title: ACCESS ROAD & LEVEL CROSSING G.A. DETAILS - SHEET 3

Drawing Number: Project | Originator | Volume | Location | Type | Role | Number — TRWH - ROD - GEN - SW_AE - DR - CH - 4074

Scale (A1): As Shown | Date: November 2018 | Job No: 18.133 | Rev: P02

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SEA WALL
A1 SCALE 1:500
A3 SCALE 1:1000

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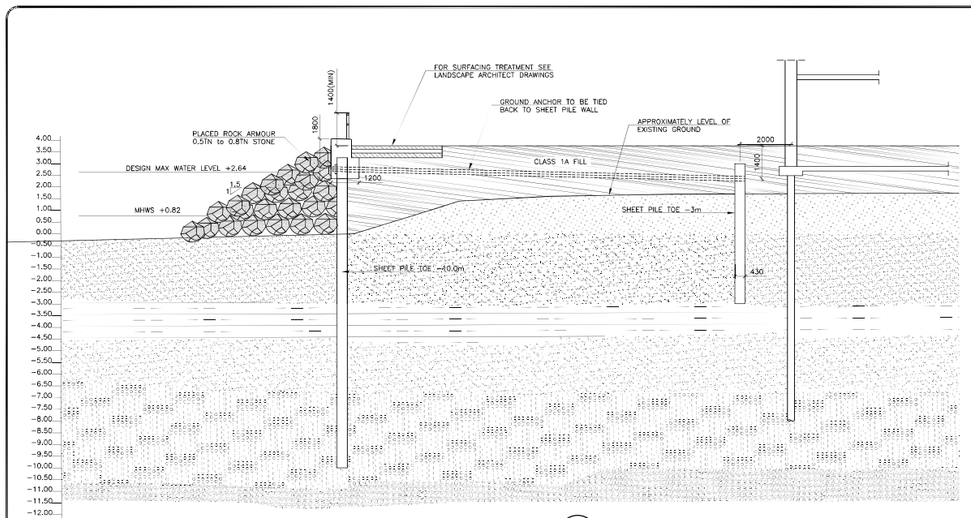
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| IM | SH | MK | MK | S4 - Stage Approval |

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|---|---|
| Project Stage | PLANNING |
| Project Title | TRINITY WHARF DEVELOPMENT |
| Drawing Title | SEA WALL GENERAL ARRANGEMENT - SHEET 1 |
| Drawing Number | Project \| Originator \| Volume \| Location \| Type \| Role \| Number: TRWH - ROD - GEN - SW_AE - DR - CH - 4081 |
| Scale (A1) | AS SHOWN |
| Date: | December 2018 |
| Job No: | 18.133 |
| Rev: | - |

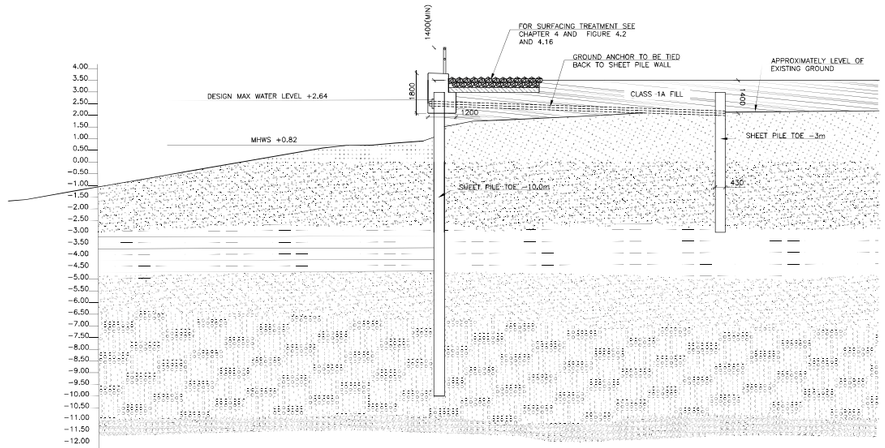
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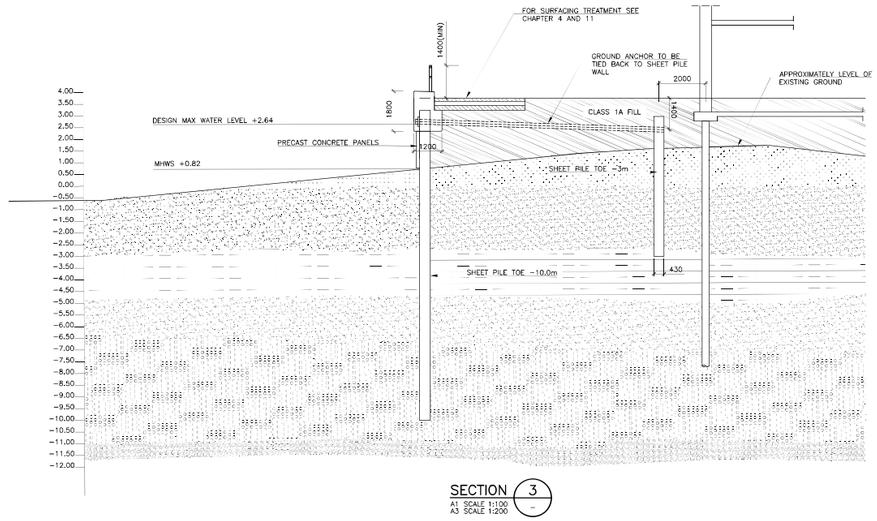
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SECTION 1
A1 SCALE 1:100
A3 SCALE 1:200




SECTION 2
A1 SCALE 1:100
A3 SCALE 1:200




SECTION 3
A1 SCALE 1:100
A3 SCALE 1:200

SEA WALL
A1 SCALE 1:100
A3 SCALE 1:200

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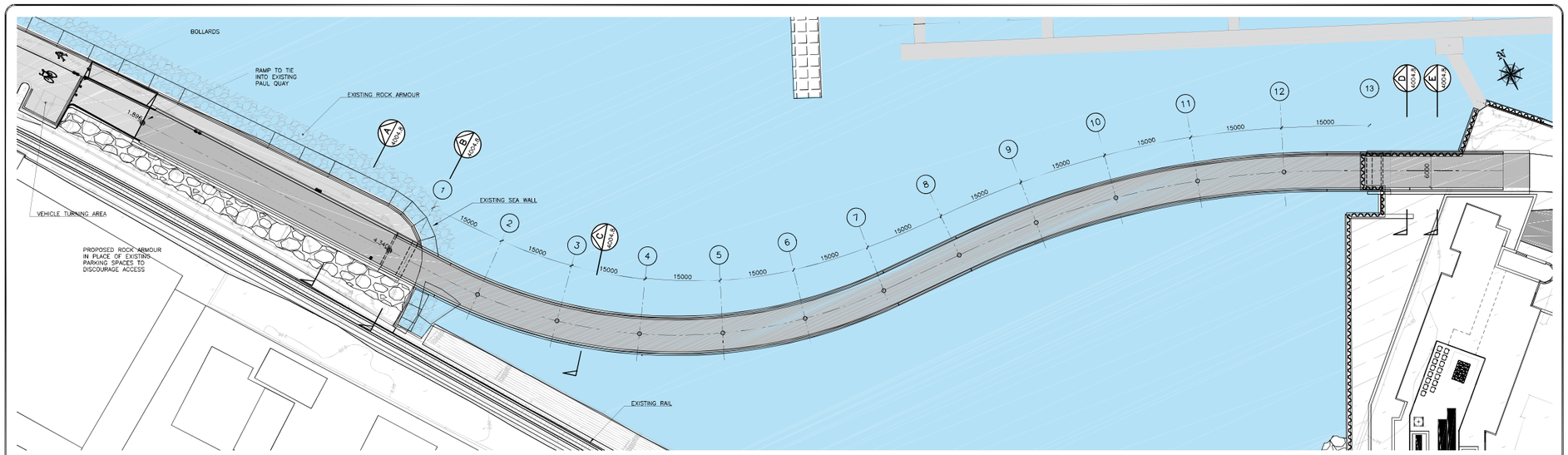
ALL LEVELS ARE IN METERS (AOD) MALIN HEAD, DONEGAL

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| Project Title | TRINITY WHARF DEVELOPMENT |
| Drawing Title | SEA WALL GENERAL ARRANGEMENT - SHEET 2 |
| Drawing Number | Project \| Originator \| Volume \| Location \| Type \| Role \| Number: TRWH - ROD - GEN - SW_AE - DR - CH - 4082 |
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| Date: | December 2018 |
| Job No: | 18.133 |
| Rev: | - |

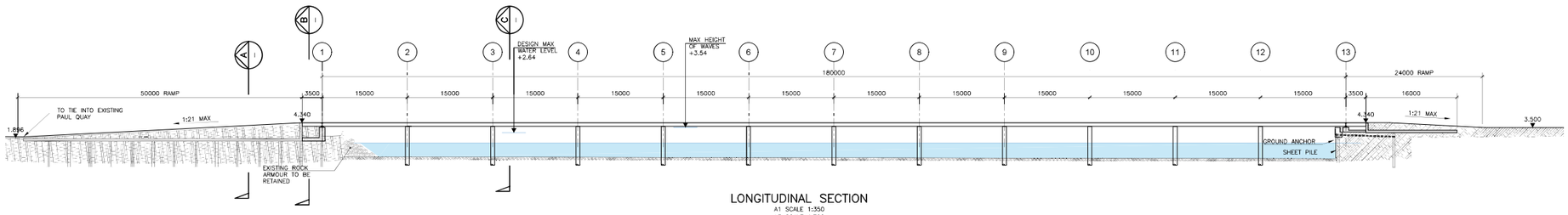
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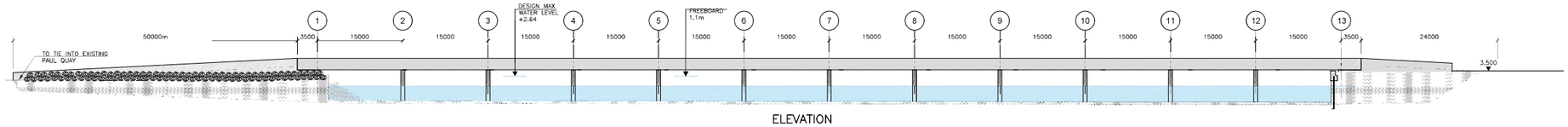
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PLAN ON PEDESTRIAN LINK BRIDGE
A1 SCALE 1:350
A3 SCALE 1:700




LONGITUDINAL SECTION
A1 SCALE 1:350
A3 SCALE 1:700




ELEVATION
A1 SCALE 1:350
A3 SCALE 1:700

ALL LEVELS ARE IN METERS (AOD) MALIN HEAD, DONEGAL

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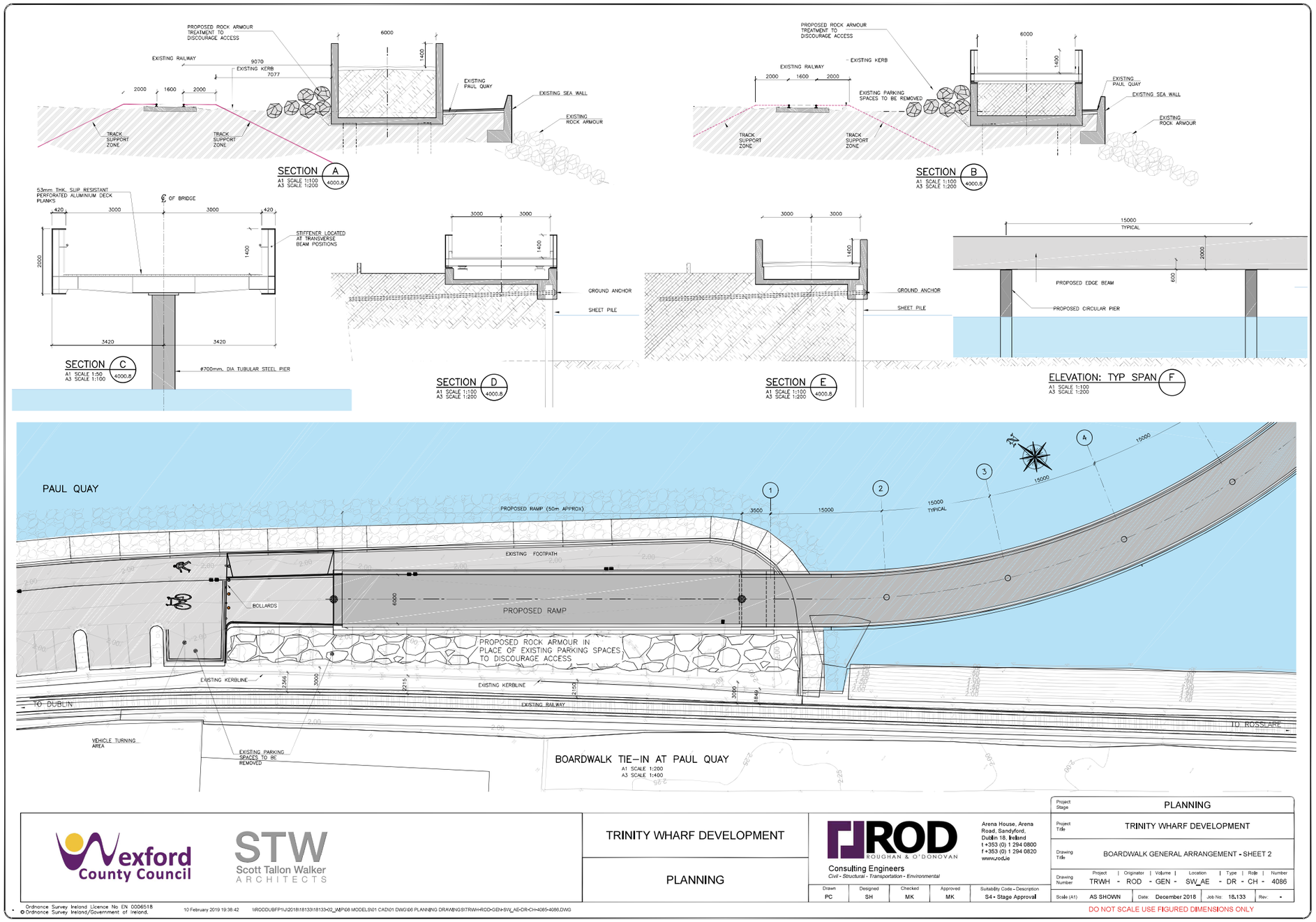
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| PC | SH | MK | MK | S4 - Stage Approval |

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| Project Stage | PLANNING |
| Project Title | TRINITY WHARF DEVELOPMENT |
| Drawing Title | BOARDWALK GENERAL ARRANGEMENT - SHEET 1 |
| Drawing Number | Project \| Originator \| Volume \| Location \| Type \| Role \| Number: TRWH - ROD - GEN - SW_AE - DR - CH - 4085 |
| Scale (A1) | AS SHOWN |
| Date: | December 2018 |
| Job No: | 18.133 |
| Rev: | - |

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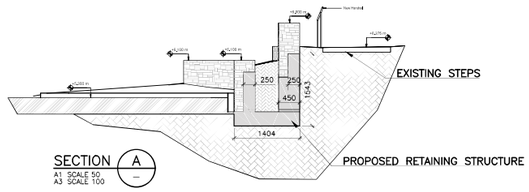
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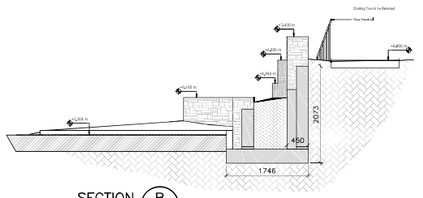

PROPOSED ROCK ARMOUR TREATMENT TO DISCOURAGE ACCESS
EXISTING RAILWAY
EXISTING KERB
9070
7077
6000
1400
2000
1600
2000
EXISTING PAUL QUAY
EXISTING SEA WALL
EXISTING ROCK ARMOUR
TRACK SUPPORT ZONE
TRACK SUPPORT ZONE
SECTION A
A1 SCALE 1:100
A3 SCALE 1:200
4000.8
EXISTING PARKING SPACES TO BE REMOVED
SECTION B
53mm THK. SLIP RESISTANT PERFORATED ALUMINIUM DECK PLANKS
℄ OF BRIDGE
420
3000
3000
420
2000
1400
STIFFENER LOCATED AT TRANSVERSE BEAM POSITIONS
3420
3420
ø700mm. DIA TUBULAR STEEL PIER
SECTION C
A1 SCALE 1:50
A3 SCALE 1:100
GROUND ANCHOR
SHEET PILE
SECTION D
SECTION E
15000
TYPICAL
PROPOSED EDGE BEAM
PROPOSED CIRCULAR PIER
600
ELEVATION: TYP SPAN F
PAUL QUAY
PROPOSED RAMP (50m APPROX)
3500
15000
EXISTING FOOTPATH
BOLLARDS
PROPOSED RAMP
PROPOSED ROCK ARMOUR IN PLACE OF EXISTING PARKING SPACES TO DISCOURAGE ACCESS
EXISTING KERBLINE
EXISTING RAILWAY
TO DUBLIN
TO ROSSLARE
VEHICLE TURNING AREA
EXISTING PARKING SPACES TO BE REMOVED
BOARDWALK TIE-IN AT PAUL QUAY
A1 SCALE 1:200
A3 SCALE 1:400
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ARCHITECTS
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Project Stage: PLANNING
Project Title: TRINITY WHARF DEVELOPMENT
Drawing Title: BOARDWALK GENERAL ARRANGEMENT - SHEET 2
Drawing Number: TRWH - ROD - GEN - SW_AE - DR - CH - 4086
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Designed: SH
Checked: MK
Approved: MK
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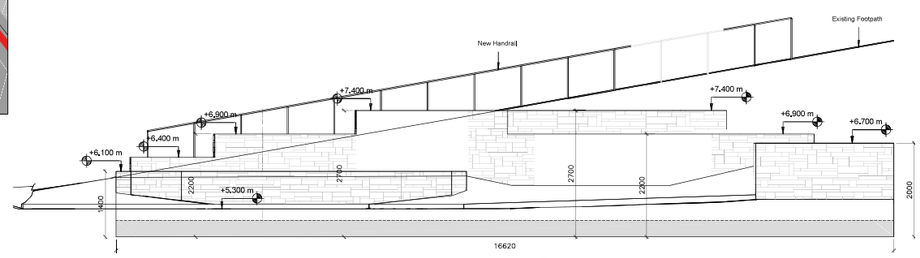

PROPOSED PLAN
A1 SCALE 1:100
A3 SCALE 1:200




SECTION A
A1 SCALE 50
A3 SCALE 100




SECTION B
A1 SCALE 50
A3 SCALE 100




SECTIONAL ELEVATION C
A1 SCALE 50
A3 SCALE 100

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NOTE:
EIAR drawings based on Design drawings prepared by Scott Tallon Walker Architects with inputs from the project team as listed at the start of this Volume.

TRINITY WHARF DEVELOPMENT

ENVIRONMENTAL IMPACT ASSESSMENT REPORT

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| Project Stage | PLANNING |
| Project Title | TRINITY WHARF DEVELOPMENT |
| Drawing Title | SEAVIEW AVENUE 3 - POINT TURN FACILITY G.A. |

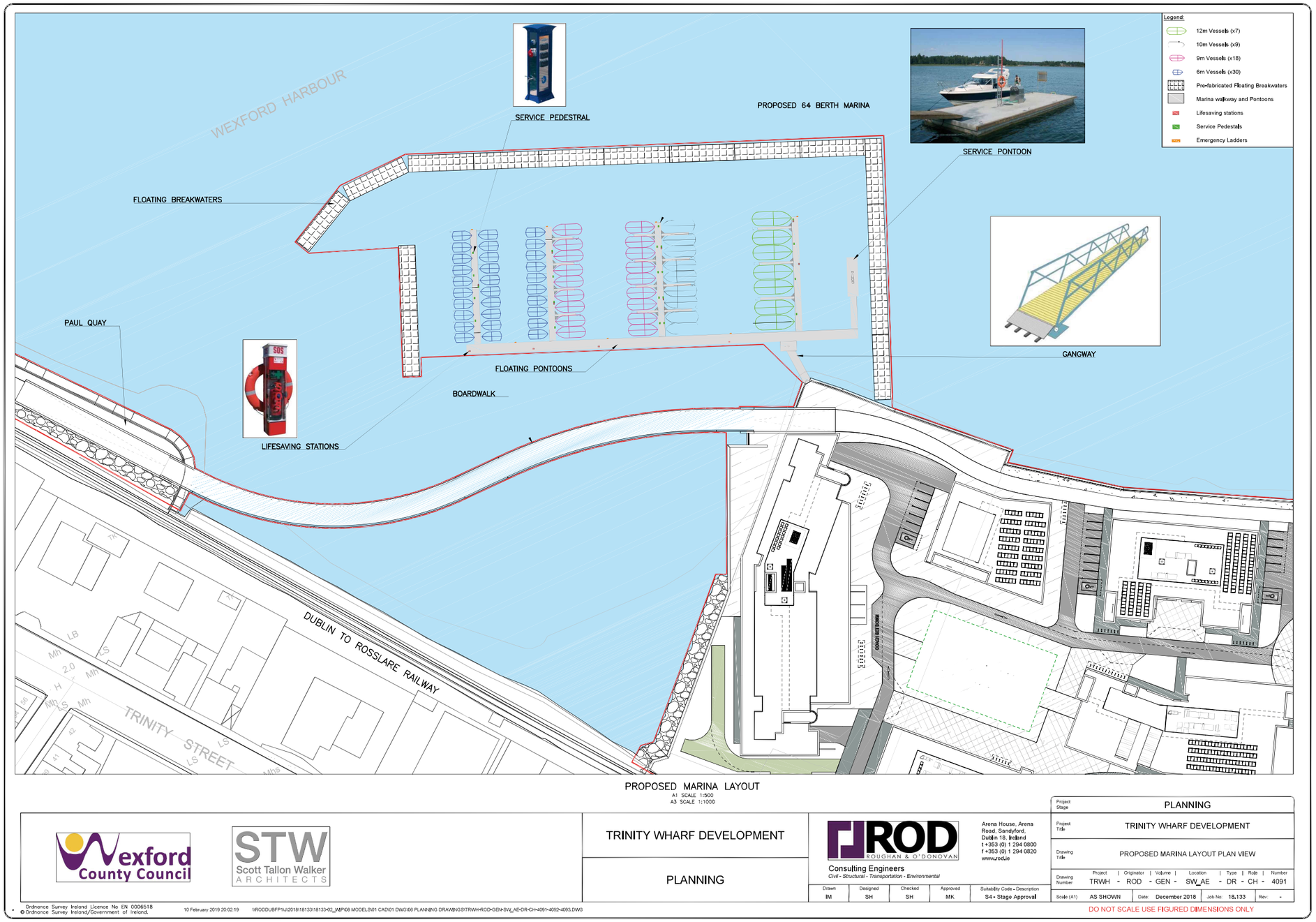
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PROPOSED MARINA LAYOUT
A1 SCALE 1:500
A3 SCALE 1:1000

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| Project Stage | PLANNING |
| Project Title | TRINITY WHARF DEVELOPMENT |
| Drawing Title | PROPOSED MARINA LAYOUT PLAN VIEW |

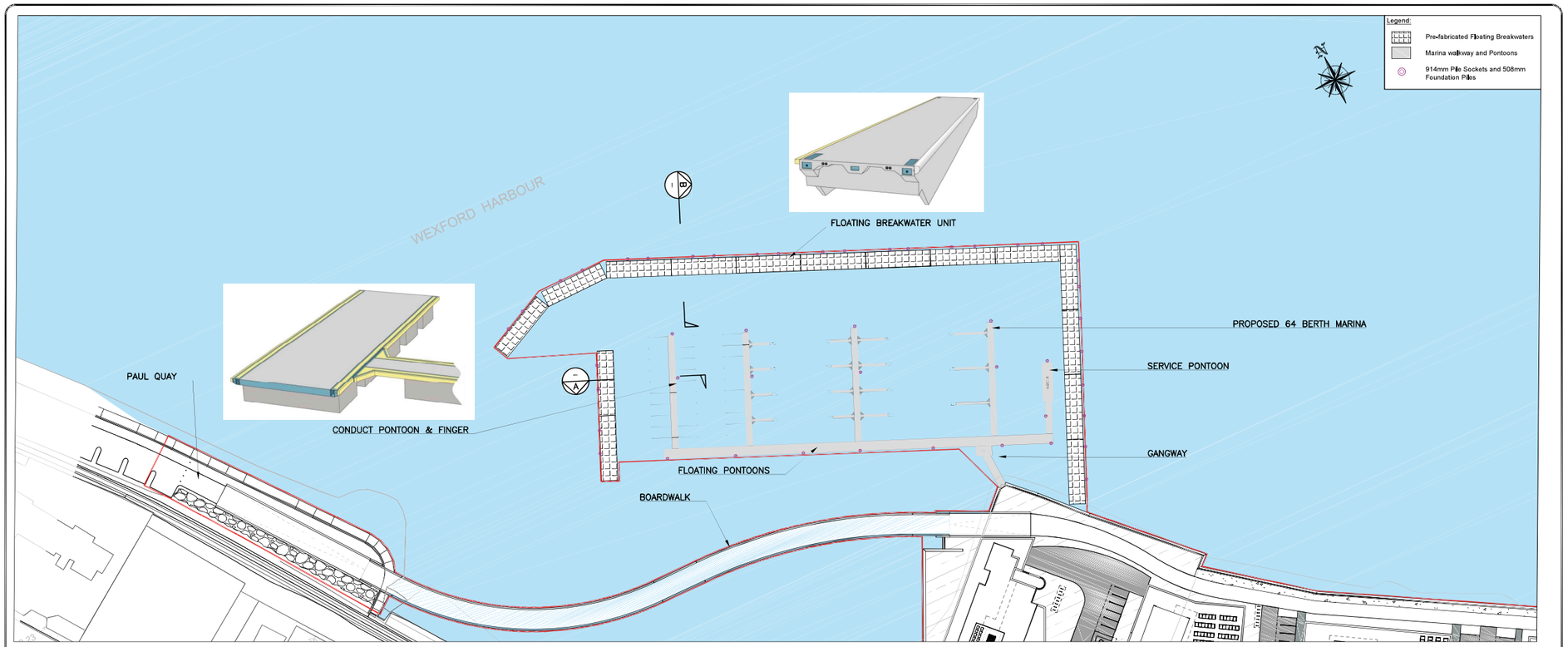
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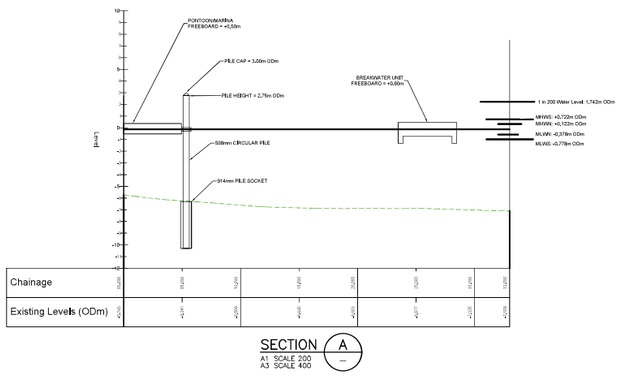
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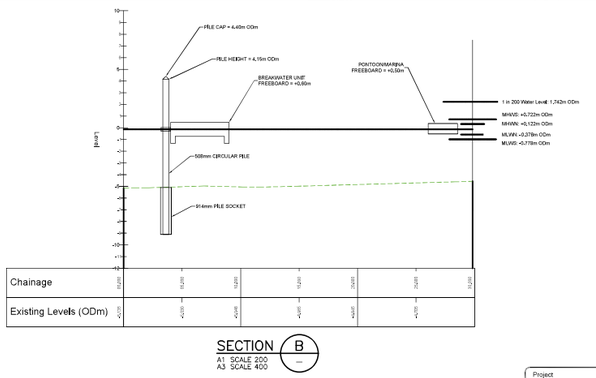
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SECTION A
A1 SCALE 200
A3 SCALE 400




SECTION B
A1 SCALE 200
A3 SCALE 400

PILE OPTION
A1 SCALE 1:600
A3 SCALE 1:1200

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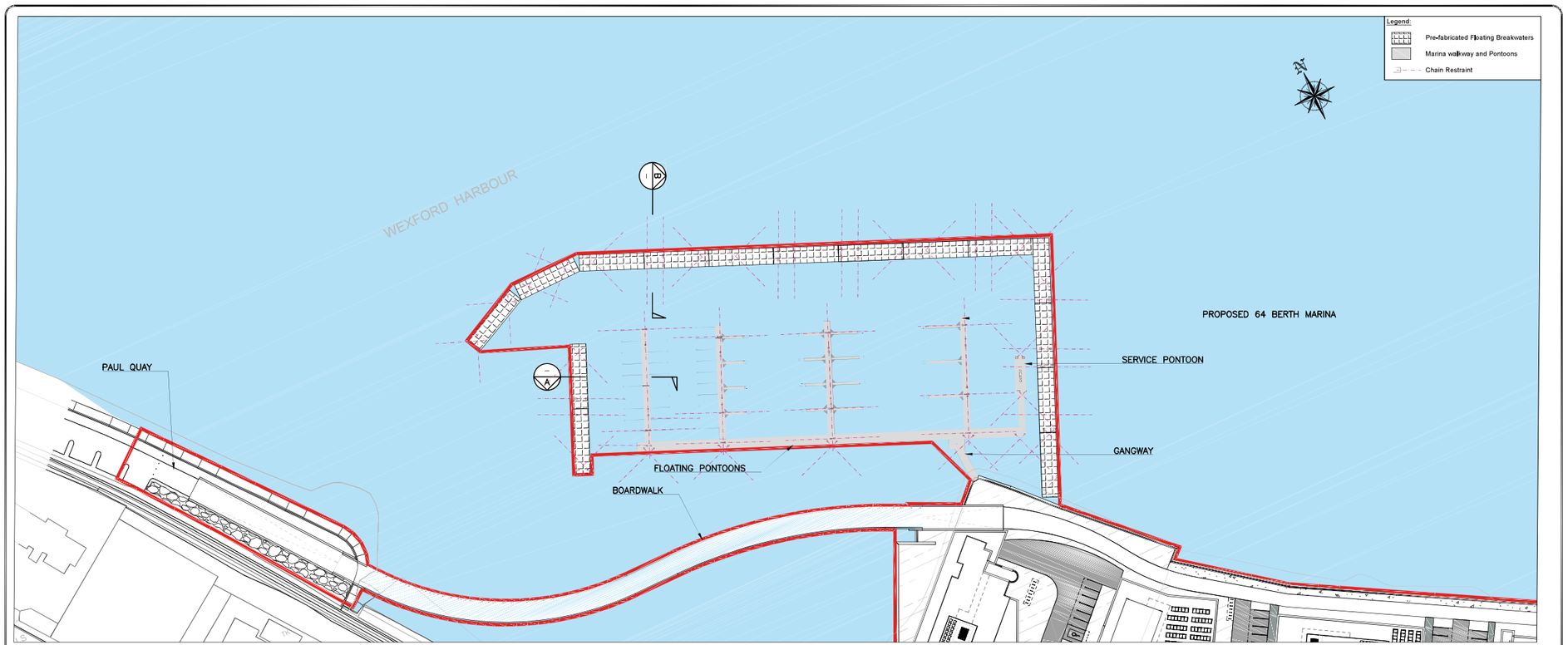
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| IM | SH | SH | MK | S4 - Stage Approval |

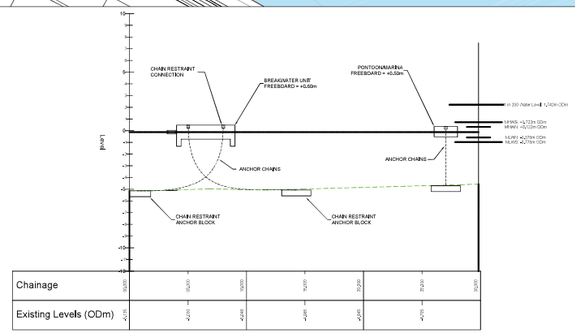
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| Project Title | TRINITY WHARF DEVELOPMENT |
| Drawing Title | PROPOSED MARINA LAYOUT RESTRAINT SYSTEM PILE SUPPORTED OPTION |
| Drawing Number | Project - Originator - Volume - Location - Type - Role - Number: TRWH - ROD - GEN - SW_AE - DR - CH - 4092 |
| Scale (A1) | AS SHOWN |
| Date: | December 2018 |
| Job No: | 18.133 |
| Rev: | - |

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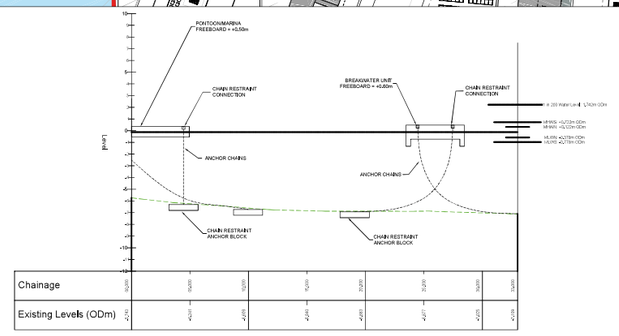
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SECTION A
A1 SCALE 200
A3 SCALE 400




SECTION B
A1 SCALE 200
A3 SCALE 400

WEIGHTED ANCHORS OPTION
A1 SCALE 1:600
A3 SCALE 1:1200

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|---|---|---|---|---|
| IM | SH | SH | MK | S4 - Stage Approval |

| | |
|---|---|
| Project Stage | PLANNING |
| Project Title | TRINITY WHARF DEVELOPMENT |
| Drawing Title | PROPOSED MARINA LAYOUT RESTRAINT SYSTEM WEIGHTED ANCHORS OPTION |
| Drawing Number | Project \| Originator \| Volume \| Location \| Type \| Role \| Number: TRWH - ROD - GEN - SW_AE - DR - CH - 4093 |
| Scale (A1) | AS SHOWN |
| Date: | December 2018 |
| Job No: | 18.133 |
| Rev: | - |

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OFF–SITE PARKING
A1 SCALE 1:2500
A3 SCALE 1:5000

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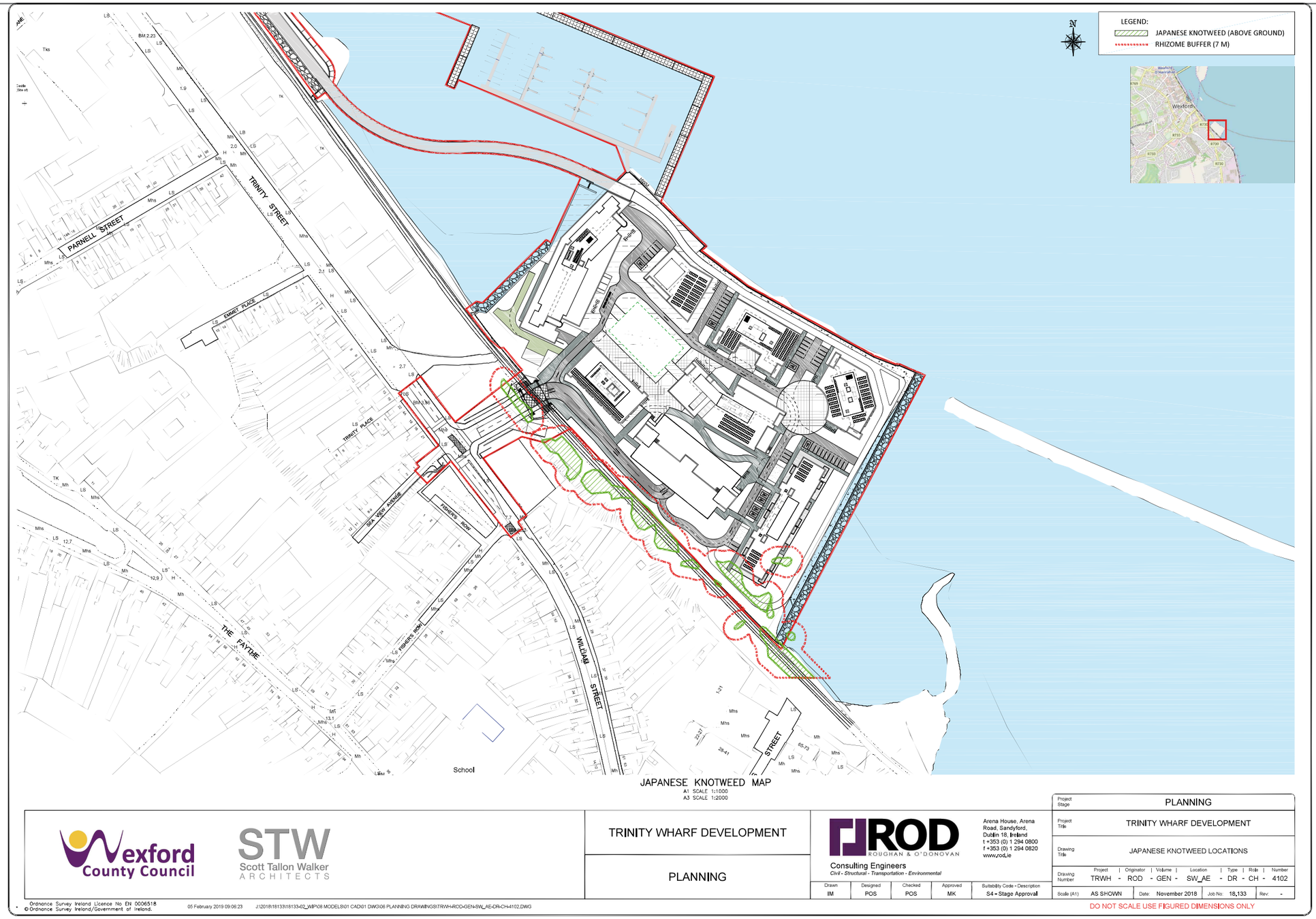
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| Project Stage | PLANNING |
| Project Title | TRINITY WHARF DEVELOPMENT |
| Drawing Title | CATCHMENT AREA FOR OFF-SITE PARKING |
| Drawing Number | Project \| Originator \| Volume \| Location \| Type \| Role \| Number: TRWH - ROD - GEN - SW_AE - DR - CH - 4101 |
| Scale (A1) | AS SHOWN |
| Date: | November 2018 |
| Job No: | 18.133 |
| Rev: | - |

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JAPANESE KNOTWEED MAP
A1 SCALE 1:1000
A3 SCALE 1:2000

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|---|---|---|---|---|
| IM | POS | POS | MK | S4 - Stage Approval |

| | |
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| Project Stage | PLANNING |
| Project Title | TRINITY WHARF DEVELOPMENT |
| Drawing Title | JAPANESE KNOTWEED LOCATIONS |
| Drawing Number | Project \| Originator \| Volume \| Location \| Type \| Role \| Number: TRWH - ROD - GEN - SW_AE - DR - CH - 4102 |
| Scale (A1) | AS SHOWN |
| Date: | November 2018 |
| Job No: | 18_133 |
| Rev: | - |

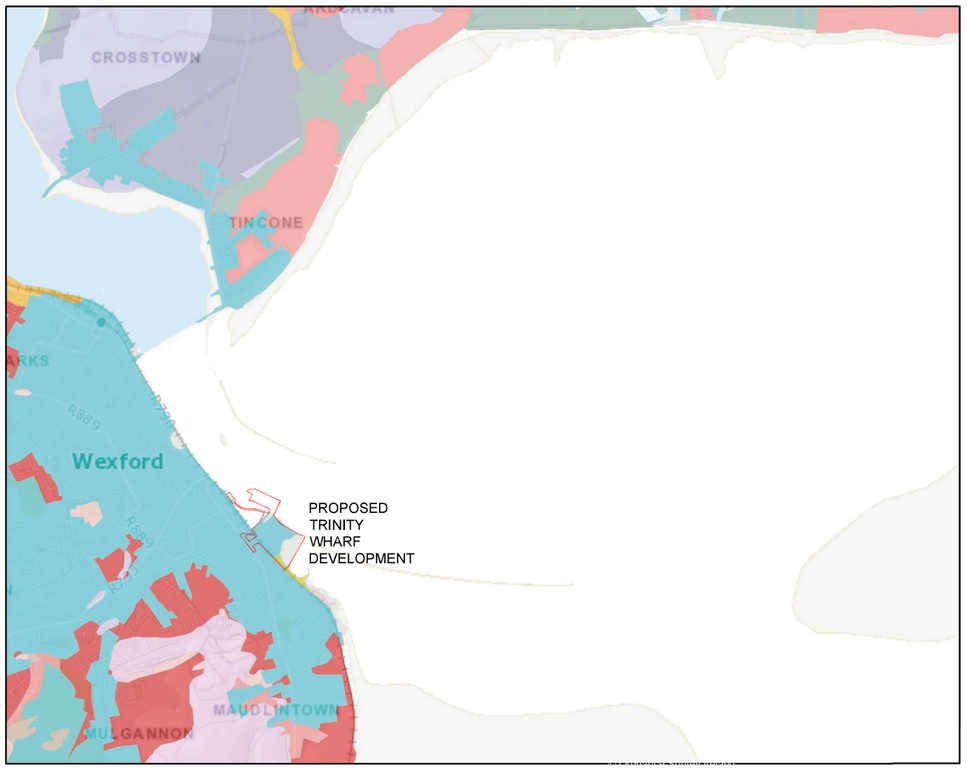
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## Subsoil Data




### Legend

- AminDW - Deep well drained mineral (Mainly acidic)
- AminPD - Mineral poorly drained (Mainly acidic)
- AminSW - Shallow well drained mineral (Mainly acidic)
- AminSP - Shallow poorly drained mineral (Mainly acidic)
- AminSRPT - Shallow, rocky, peaty/non-peatymineral complexes (Mainly acidic)
- BminSW - Shallow well drained mineral (Mainly basic)
- BminSP - Shallow poorly drained mineral (Mainly basic)
- AlluvMIN - Alluvial (mineral)
- Lac - Lacustrine type soils
- MarSands - Marine sand and gravel
- MarSed - Marine/estuarine sediments
- Made - Made ground
- Water - Water

Scale: 1:25,000 @ A3

**Geological Survey Ireland**

N W E S

0 0.175 0.35 0.7 mi
0 0.275 0.55 1.1 km

Map Centre Coordinates (ITM) 706,565 622,085
10/17/2018, 10:21:09 AM

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ROD ROUGHAN & O'DONOVAN
Consulting Engineers
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Arena House, Arena Road, Sandyford, Dublin 18, Ireland
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|---|---|---|---|---|
| SH | FO'K | FO'K | BC | S4 - Stage Approval |

| | |
|---|---|
| Project Stage | PLANNING |
| Project Title | TRINITY WHARF DEVELOPMENT |
| Drawing Title | TEAGASC SOIL MAPPING |
| Drawing Number | Project - Originator - Volume - Location - Type - Role - Number: TRWH - ROD - GEN - SW_AE - DR - CH - 4103 |
| Scale (A1) | 1:12500 @ A1 |
| Date: | November 2018 |
| Job No: | 18.133 |
| Rev: | - |

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## Bedrock Data




Scale: 1:25,000 @ A3

**Geological Survey Ireland**

N W E S

0 0.175 0.35 0.7 mi
0 0.275 0.55 1.1 km

Map Centre Coordinates (ITM) 706,406 621,552
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### Legend

**Bedrock Structural Symbols**
- Strike and dip of bedding, way up unknown
- Strike and dip of first foliation

**Bedrock Stratigraphic and Structural lines**
- Area
- Fault

**Bedrock Outcrop**
- Bedrock Outcrop

**Bedrock Rock Units**
- Cullenstown Formation
- Shelmaliere Formation
- Ballysteen Formation
- Dolomitised Limestone (Ballysteen Formation)
- Duncormick Conglomerate Formation
- Porter's Gate Formation
- Wexford Formation

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|---|---|
| Project Stage | PLANNING |
| Project Title | TRINITY WHARF DEVELOPMENT |
| Drawing Title | GSI BEDROCK GEOLOGY MAPPING |
| Drawing Number | Project \| Originator \| Volume \| Location \| Type \| Role \| Number: TRWH - ROD - GEN - SW_AE - DR - CH - 4104 |
| Scale (A1) | 1:12500 @ A1 |
| Date: | November 2018 |
| Job No: | 18.133 |
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## Groundwater Aquifer Data




Legend

*Bedrock Aquifer Faults*

- Bedrock Aquifer Faults

Bedrock Aquifer

- Rkd - Regionally Important Aquifer - Karstified (diffuse)
- Rf - Regionally Important Aquifer - Fissured bedrock
- Lm - Locally Important Aquifer - Bedrock which is Generally Moderately Productive
- Ll - Locally Important Aquifer - Bedrock which is Moderately Productive only in Local Zones
- Pl - Poor Aquifer - Bedrock which is Generally Unproductive except for Local Zones

Scale: 1:25,000 @ A3

**Geological Survey Ireland**

N W E S

0 0.175 0.35 0.7 mi
0 0.275 0.55 1.1 km

Map Centre Coordinates (ITM) 705,897 621,023
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| SH | FO'K | FO'K | BC | S4 - Stage Approval |

| | |
|---|---|
| Project Stage | PLANNING |
| Project Title | TRINITY WHARF DEVELOPMENT |
| Drawing Title | GSI AQUIFER AND GROUNDWATER BODY (GWB) MAPPING |
| Drawing Number | Project - Originator - Volume - Location - Type - Role - Number: TRWH - ROD - GEN - SW_AE - DR - CH - 4105 |
| Scale (A1) | 1:12500 @ A1 |
| Date | November 2018 |
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## Groundwater Vulnerability Data




Legend

Groundwater Vulnerability

- X - Rock at or near surface or Karst
- E - Extreme
- H - High
- M - Moderate
- L - Low

Scale: 1:25,000 @ A3

**Geological Survey Ireland**

0 0.175 0.35 0.7 mi
0 0.275 0.55 1.1 km

Map Centre Coordinates (ITM) 705,532 621,485
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| Project Stage | PLANNING |
| Project Title | TRINITY WHARF DEVELOPMENT |
| Drawing Title | GSI GROUNDWATER VULNERABILITY MAPPING |

| Drawing Number | Project | Originator | Volume | Location | Type | Role | Number |
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| | TRWH | ROD | GEN | SW_AE | DR | CH | 4106 |

| Scale (A1) | Date | Job No | Rev |
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| 1:12500 @ A3 | November 2018 | 18,133 | - |

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**Dublin**
19 Merrion Square, Dublin 2,
D02 VR80, Ireland
Tel: +353 (1) 669 3000
Email: michael.tallon@stwarchitects.com

**London**
10 Cromwell Place, London,
SW7 2JN, UK
Tel: +44 (207) 589 4949
Email: eoin.omorain@stwarchitects.com

**Cork**
72 South Mall, Cork,
T12 VX9A, Ireland
Tel: +353 (21) 432 0744
Email: david.flannery@stwarchitects.com

**Galway**
22 Eyre Square, Galway,
H91 XP3Y, Ireland
Tel: +353 (91) 56 4881
Email: bryan.roe@stwarchitects.com